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Popular Mechanics

Written So You Can Understand It

Vol. 13 MAY, 1910 No. 5

GIGANTIC OUTDOOR TELESCOPE

A powerful telescope, one of the largest in the world, has just been completed at Treptow, near Berlin, Germany, and will be used for the time being in following Halley's comet in its dash through space. The mounting of the telescope, which has a tube more than 65 ft. long, is different from that of any instrument in this country. Instead of being mounted close to its center on a high standard, the mounting is at the base of the tube. A heavy counterweight is provided to so balance it that its tube can be elevated and lowered in somewhat the same manner as a counterbalanced lift bridge. The low building over which the tube extends contains the study rooms and offices of the astronomers. The great revolving domes present on the usual type of observatory building are entirely absent in this instance.

The Huge German Telescope

DRAINING THE FLORIDA EVERGLADES

In the attempt being made at the present time to drain the Florida everglades, a ditch 60 ft. wide and 14 ft. deep is being scooped out by a powerful dredge. The sharp edge of the scoop has to cut through the solid lime rock which underlies the layer of sand and muck. The cut has to be dredged in sections, and each section has to be dammed so that the dredge will have sufficient water to float upon. These dams are built as the dredge progresses, and the moment a new one is built the old dam is torn away, thereby allowing the ditch to drain off the water in that section.

THE COST OF AEROPLANING

It is not lack of courage, not lack of proper and convenient flying grounds, that prevents many would-be fliers from soaring, and thus make aeroplaning more popular. It is the cost.

Aviation is a very expensive sport, and will continue to be for some time. Unless the aviator is a skilled mechanician, he must employ one continually, and also a number of assistants. It is not like running an automobile out of a garage, taking a spin, and returning it at pleasure.

The initial cost of an aeroplane, one of the approved types, is between three and five thousand dollars. Many automobiles cost that amount also, but with a reasonable amount of care and, barring accidents, one of the high-priced machines needs comparatively little repairing, and the initial cost is the greatest consideration.

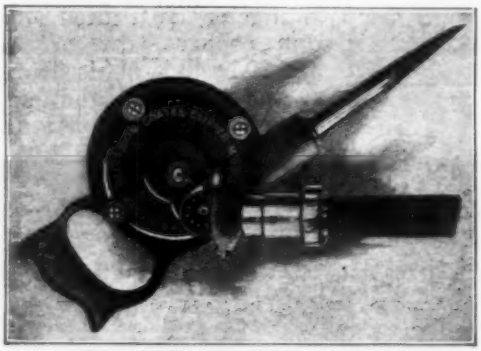
A shed for the aeroplane costs another $500, and the stock of tools and replacements necessary for the ceaseless repairs involved in experimental flights with involuntary descents means another $500. Then, too, the risk of damage during the experimental work is so great that the aviator should have two aeroplanes.

It is comparatively easy to learn the operation of an automobile. The

clutches, levers, and brakes soon become familiar. But the driving of an aeroplane presents many complications other than the actual operation of the levers and an acquaintance with the engine, for the aviator must study air currents and their whimsical ways.

ELECTRICALLY-DRIVEN CHIPPER

A chipper that operates on the same principle as the pneumatic hammer, but which is driven by an electric motor instead of by compressed air, is shown in this illustration. It is the latest addition to power-driven hand tools, and presents many new features. The worker holds it by a handle of about the same shape as a saw handle. Forward of the handle is a circular casing containing the hammer mechanism proper, and forward of this is the chipping hammer. A flexible shaft is employed to transmit the drive from a ½-hp. motor to a mongrel gear that operates the hammer mechanism. The tool strikes nearly 2,000 blows a minute with a force equal to that of a pneumatic hammer.



Chipping Hammer Driven by Motor

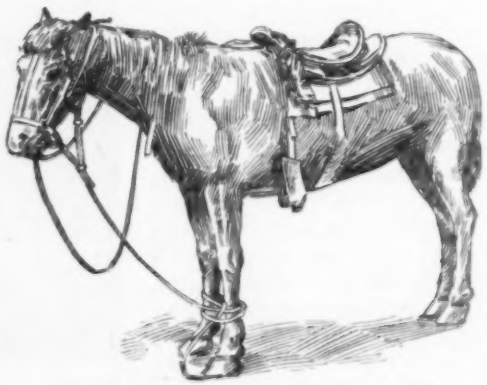
ENGINE DIVES FROM TRESTLE

A steam pipe in the cab of this locomotive burst while it was running slowly over a coal trestle at Calumet, Mich. As a result, the locomotive dove off the trestle and buried its head in the snow, although the speed was so slow that the rear end did not completely clear the trestle. The engineer shut off steam and jumped before the locomotive took its plunge.

Result of Burst Steam Pipe

HITCHING A HORSE TO ITSELF

The lack of hitching posts in the city of Point Arena, Cal., has resulted in the hitching of the horse to himself in the primitive manner shown in the illustration. A horse is thus hobbled by making a slip-noose of the halter-strap around one of the forward legs. If he starts to run away the result is a sharp pull of the head at every step.

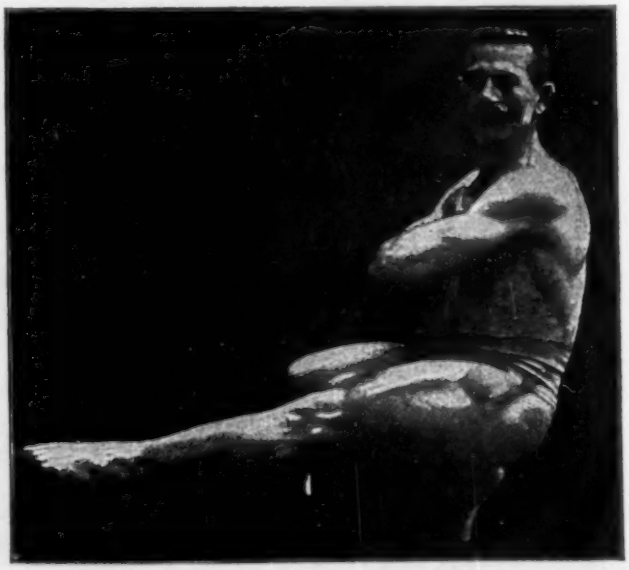


How Horses Are Hobbled in a California City

MUSCULAR DEVELOPMENT NECESSARY TO EXECUTE DANCE

The wonderful crouching attitude, in which, alternately, one leg is shot out straight while the other is bent almost double in such a way that the dancer appears to rush rapidly over the stage in a sitting posture, is a well known figure of the Russian national dance. The illustrations show M. Peschkoff, one of the best exponents of this style of dancing, in the most difficult attitude of the characteristic dance, and the unusual muscular development required for its execution. The extraordinary lightness of his step and the speed with which he rushes from one side of the stage to the other, give little idea of the years of practice necessary to achieve perfection.

What the Public Sees—It Looks Easy



The Muscular Development Required

¶Two searchlights are now in use in a freight distributing yard at Harrisburg, Pa.

KITE FLYING AND ELECTRIC WIRES IN INDIA

The youth of India are as enthusiastic kite-flyers as their Chinese neighbors, and to make the sport exciting, have evolved kite-cutting bouts which are responsible for a curious accident and the unpremeditated cutting of electric wires. When two kites are being flown near together, it is the object of each boy to so manipulate his string as to make it cross and cut that of his rival. To facilitate this operation, special string is prepared by running it through a mixture of glue and powdered glass.

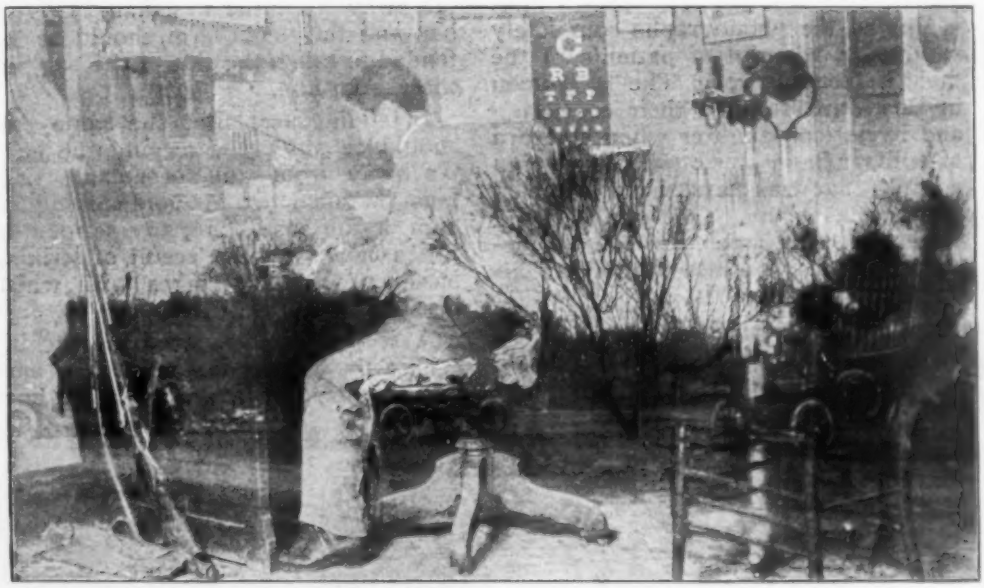
Thinking to improve on this method, one Calcutta youngster substituted very thin copper wire for the first 30 or 40 ft. of his string, at the kite end, and proceeded to fly it. As he hauled it in, the copper wire crossed a 500-volt trolley wire. The wire became red hot, and several of the boy's fingers were burned off. His body also became

tangled in the wire, which burnt deep into the flesh before fusing or breaking off. When he was examined in the hospital some of the wire was still embedded in his chest.

An instance occurred recently in Rangoon in which the glass-covered kite string was responsible for the death of a coolie. A bare overhead wire, part of the street-lighting circuit, broke and fell on a coolie, who, however, extricated himself. A few minutes later another coolie walked upon it and was killed. Examination proved that the wire had been cut by a glass-covered kite string being pulled over it. Other instances were found of partially severed wires, and an experiment was made in which a No. 10 wire was completely cut through in about half an hour by drawing 300 yd. of kite string over it. As soon as one of the overhead wires receives a nick the next string flown over it naturally catches at the same point and continues the work of destruction.

A RESULT OF DOUBLE EXPOSURE

An unusually interesting example of double-exposure photography is shown in this illustration, which was received from Dr. L. M. Swigert, of Cave Creek, Arizona. A party was out hunting when the first exposure was made, a snapshot at 100 ft. The second exposure was made in Dr. Swigert's office the next day, at a distance of 10 ft., with a minute exposure. As a result, two trees are well defined, the mountains are shown, and three of the automobiles of the party are visible. One of them, a 7-passenger touring car, is under the chair the doctor is sitting in. Another automobile is apparently resting on the seat of a straight-backed chair.



Hunting and Office Scenes in One Photograph

TO SOOTHE INSANE WITH MUSIC

Phonographs and pianos have been placed in the insane wards of the Ohio state hospital at Massillon, in hope that the music will soothe the patients, and aid in effecting a cure. Dr. Henry C. Eyman, superintendent of the insti-

tution, says that it is yet too early to make any statement concerning the success of the experiment, but the effect of the music has been very curious.

One of the phonographs completely subdued a roomful of patients of the most demented type. The 60 women in this ward stopped their chattering and hysterical laughter when a record of military band music was played, and a smile that was natural was seen on the faces of many. One girl, believed to have been hopelessly insane, becomes quiet and quite sane when allowed to play a piano.

Proper Method of Feet-First Sliding

INSTRUCTION IN SCIENTIFIC BASEBALL SLIDING

One of the most important requirements of a baseball player in the major leagues is the ability to run bases, and it is in this department of the game that sliding plays such a prominent part. Yet it is only recently that coaches of college teams have made any special effort to instruct the players in the best methods.

During the past couple of months, however, the coaches of the University of Pennsylvania put their players through a strenuous and systematic training that taught them how to slide to a base without tearing themselves all to pieces, and with the best chance of getting there safely.

The illustrations show the correct way to slide to a base head first and feet first, as practiced by the University of Pennsylvania team. When sliding head first, the body should be as far away from the baseman as possible, and the inside arm should be extended to touch the side of the bag furthest from him.

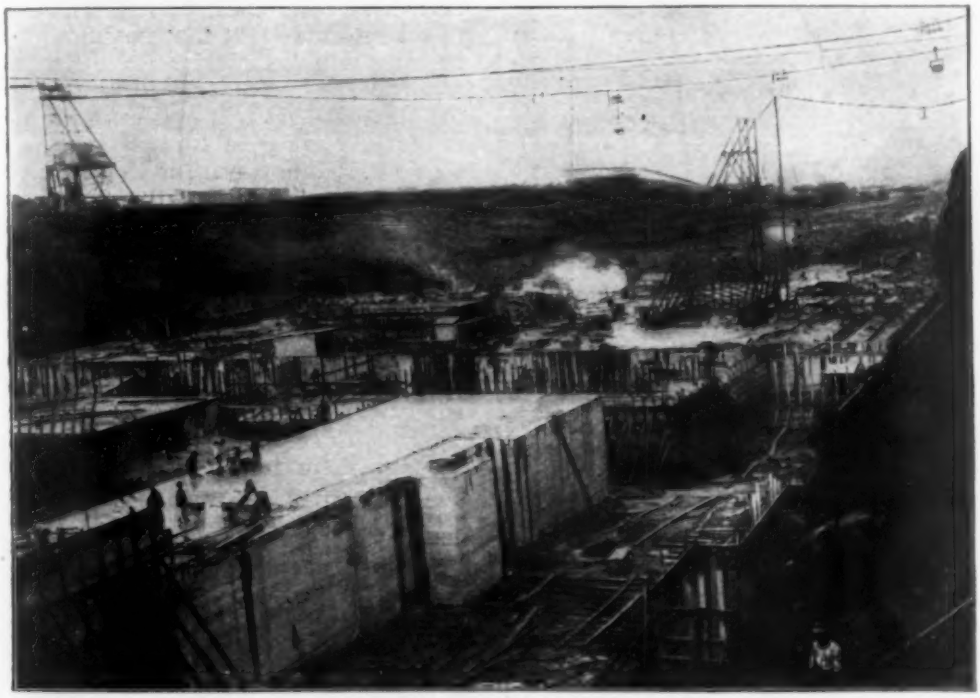
In sliding feet first the same rule should be observed, keeping the body far away from the baseman. Care must be taken also to avoid spiking the man at the base, for many serious injuries have been the result of striking basemen with the spikes with which baseball shoes are fitted.

A second or two saved in reaching a base by sliding has more than once won a game that otherwise would have been lost by the exasperating margin of one run.

Correct Way to Slide Head First

LOCK CONSTRUCTION OF THE GATUN DAM

This photograph shows the progress made up to date in the construction of the locks of the Gatun dam of the Panama canal. The huge block of concrete in the foreground gives an excellent idea of the stupendous dimensions of this part of the work. Stretching overhead are the cableways used in handling material. Over 200,000 cu. yd. of concrete have been laid at the site of the dam. The record day's work was done on Feb. 12, when 2,869 cu. yd. were laid.



Gatun Dam as It Looks at Present

SCHOONER ASKS ITS WAY ACROSS THE OCEAN

It is easy enough for a person to find his way across a continent by asking the way of the occasional passerby, but it would hardly be considered safe or even possible for a vessel to make a long voyage by the same system.

But so traveled are the ocean lanes that this has been accomplished in some instances. Recently the French liner, "La Savoie," two days out of Havre, was called upon by a sailing ship, bound east, to give her longitude. In other words, the schooner wanted to know just how near to the coast of Europe she had arrived, and what time of day it was.

It was learned that the skipper had died, and no other member of the crew was able to make observations with the sextant.

The officers of the liner gave the sailing ship the desired information, the international code of signals being employed to ask for and to furnish it. The speeding liner was obliged to slow up to accommodate the sailing vessel. Except in cases of dire distress, like that of the lost schooner in this case, to bother a liner in such fashion would be as impertinent as it would be on shore for a person to flag a limited train to ask the conductor how far it was to the next town.

THE FIRST AIRSHIP LIGHT-HOUSE

What is said to be the first light-house built for airships has just been

To Guide Airships at Night

erected on the top of a small railroad building at Spandau, Germany. It consists of 38 powerful electric lamps, which shoot a glaring light skyward. Its purpose is to guide the dirigibles of the German army at night. One of the great gun plants of Germany is located at Spandau.

MULES HAVE CONCRETE BATH IN MINE

A huge concrete bathtub, some 40 ft. long, and a few inches more than 4 ft. deep, has been installed in the Henry colliery of the Lehigh Valley Coal Co. at Plains, Penn., for the accommodation of the mine mules.

This unique mine improvement is built at the entrance of the mule barn. The long-eared beasts are pretty tired when they conclude the day's work, but when they strike the bath all fatigue disappears and they rush in, crowding each other for the deepest place in the tub.

Directly over it runs a perforated pipe, and when the mules have disported themselves in the water in the tub, the shower bath is turned on. The speed with which a mine mule will hurry to the barn when the day's work is over is proverbial, yet with all their desire to get the second meal of the day, they have to be driven out of the bath by force. One old fellow is said to take such delight that no amount of coaxing will get him to leave the tub until he has had at least 10 minutes of the fun. Others will not leave the tub until the shower is turned on, and it seems that this feature is the most enjoyable. Some of them, the mine foreman says, will look at the attendants longingly and then swing their heads appealingly towards the spray pipe until someone turns it on.

The bath is expected to prolong the vigor and vitality of the mules. The driver boys are the only workers in the mine who are not absolutely in sympathy with the innovation, the bath keeping them in the mine 10 or 15 minutes longer than before, yet the enjoyment of their dumb charges seems even to offset this inconvenience to a great extent.

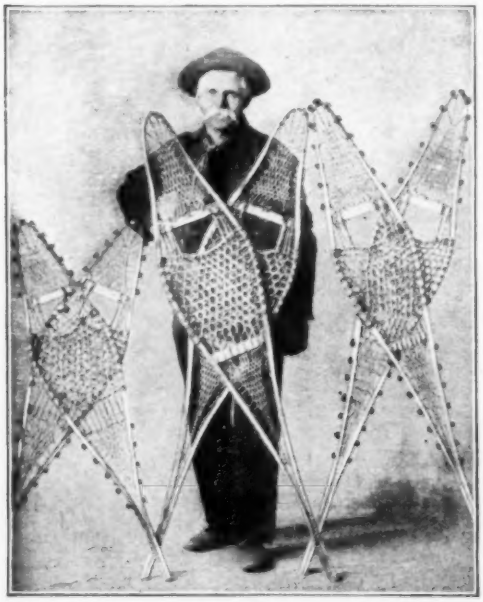
AN EXTRAORDINARY MOTOR VEHICLE

Just what to call this remarkable motor device is puzzling, and for a better name it is mentioned as a vehicle, although nothing is carried upon it except its power plant. It is, in reality, a tug, and its purpose is to pull a person on skees up the slopes. The person being thus towed, straddles the back part of the device, and stands upon his skees, which are tied to the base vehicle by leather thongs. The motor sets upon a broad runner, and the means of propulsion is a worm-like gear which engages with the surface of the ice or hard snow.

A Motor-Sled Tug

PEARY'S NORTH POLE SNOWSHOES

The snowshoes Peary used on his famous dash to the North Pole were



Some of the Peary Snowshoes and Their Maker

made by a veteran New England guide, who lives away up in the northern part of Maine. He furnished the expedition with 48 pairs, 4 ft. long and 1 ft. wide, and with 12 pairs, 5 ft. long and 1 ft. wide. They were built to defy the cutting ice. Just how is told by the maker himself:

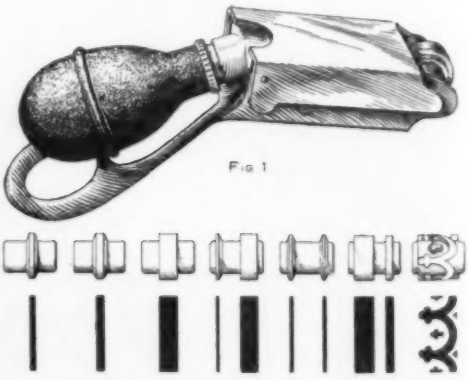
"All the work of filling was done by hand, and I was able to get nearly all the stretch out of the rawhide, so they would not stretch a second time. Even though the shoes became wet they would sag but little. The stretching was done by muscle, and there was 200 ft. of rawhide put in every pair, cut with a common jackknife. In the construction of bows for the shoes the ash logs are first cut into squares and then thoroughly dried, after which the long pieces are cut into strips of various sizes. The strips are placed in a wooden box filled with cold water, and steam is gradually turned on. When the wood is sufficiently pliable it is placed in molds, where it remains until rigid once more. This process requires three or four days in a warm place and two weeks in a cold one. The molds are made with great care.

"For the snowshoe we owe a debt to the Indian, and it is doubtful if we would have perfected the shoe to the present high state had not the Indian in the first place told us how to make something to wear on our feet that would make simple the navigation of the snow bank."

STRIPING AND STENCIL WHEEL FOR PAINTERS

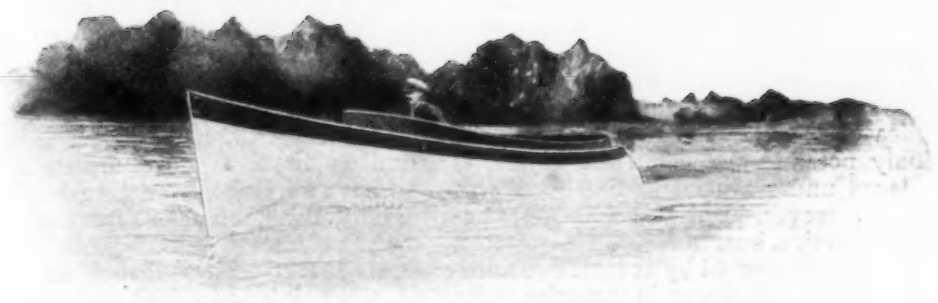
A painting device, the wheels of which make special stripe and stencil designs by simply rolling them over the surface of the object to be decorated, is shown in the illustrations, along with a few of the designs it makes. The mechanism is used on any smooth surface, whether iron, marble, stone, brick, or wood, and it is intended for use in striping coaches, automobiles, bicycles, and other vehicles, as well as furniture, walls and ceilings.

About 24 different wheels are used with the machine, half of which have ornamental designs upon them, while



The Stenciling and Striping Machine and Some of the Designs It Executes

the others are for ordinary striping. Any design desired can be furnished, however.



Twelve Miles an Hour in an 18-ft. Boat

THE GROWTH OF THE MOTORBOAT

By Francis Buzzell

THERE is not a day in the whole year in which there are not thousands of motorboats in operation in the waters of the United States and other countries. But when summer arrives and the north is like the south as far as motorboating is concerned, it would be difficult to find a body of water or stream of any considerable size between the Arctic and Antarctic regions whose waters are not broken by the prow of the gasoline-driven craft.

In many localities the traveler by water runs into veritable shoals of motorboats, the great diversity in size, shapes of hulls, and equipment of which, provides a wonderful example of the growth of the industry, and the extent to which it is taking firm hold on all classes, from the humble owner of a fishing boat to the millionaire owner of a 100-ft. sea-going cruiser.

The steady advance in both boat and engine construction is truly wonderful. The day of the floating tub, equipped with an engine that could be depended upon to run perhaps once in ten times, is a thing of the past. It was the natural and necessary first stage, a stage that the automobile and motorboat soon outgrew and the aeroplane and dirigible are fast leaving behind.

Some time ago the makers of marine gasoline engines began to realize that there was no real reason why the motorboat engine should not be depended upon to give as good and positive a service as the automobile engine. This seemed ridiculous at first, because the average motorboat engine is run at full power nearly all the time, while the average automobile engine is having a comparatively easy time when the machine is running on a good road. But the marine engine builders met this problem, and today the engines turned out by the reputable motorboat concerns can be depended upon to run under almost any condition, if properly cared for and understood.

Remarkable as it may seem, the gasoline-driven land vehicle and the gasoline-driven water vehicle are becoming more closely related each year. The latest type of bodies for the former are spoken of as torpedo-shaped and very much resemble the upper part of the hull of a boat, while the power plants and method of operation of the most up-to-date motorboats are copied after those of the automobile. Several automobile concerns, in fact, are now furnishing boat builders the same engine, slightly modified, that they install in the automobiles.

A glance at the illustration showing the controlling and steering mechanism of an up-to-date motorboat gives an excellent demonstration of how similar it is to the mechanism of the automobile. There is hardly a motorboat concern that is not turning out a sim-

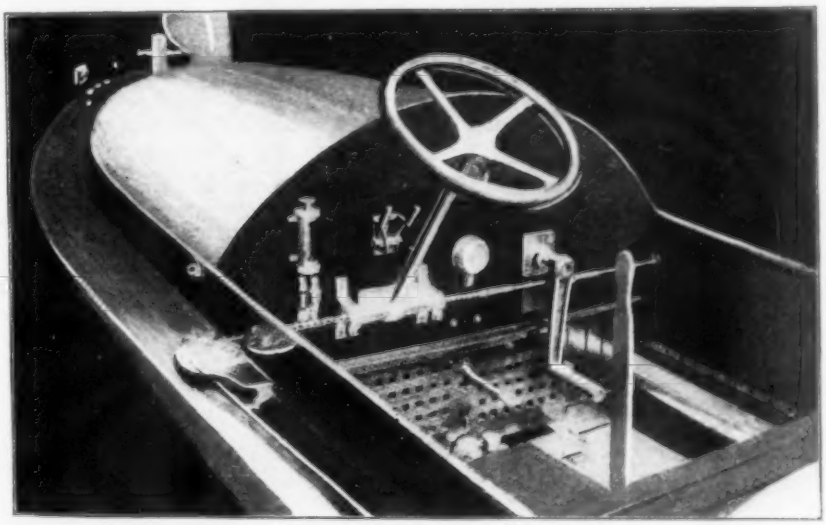
ilar arrangement, and calling the product "automobile boats." The engine is started by means of the crank attached to the transom, which corresponds to the "dash" of an automobile. The idea of the crank in this position (the only possible one when the engine is placed under a hood in the bow) was not, however, borrowed from automobile practice, but, to reverse the matter, has been borrowed by at least one automobile manufacturer in America, who saw the advantage of having the crank where the chauffeur could start the engine from the driving seat. The rest of the mechanism on the transom was copied from the automobile. The lever, or clutch, seen just back of the starting crank, throws the propeller into action or reverses it.

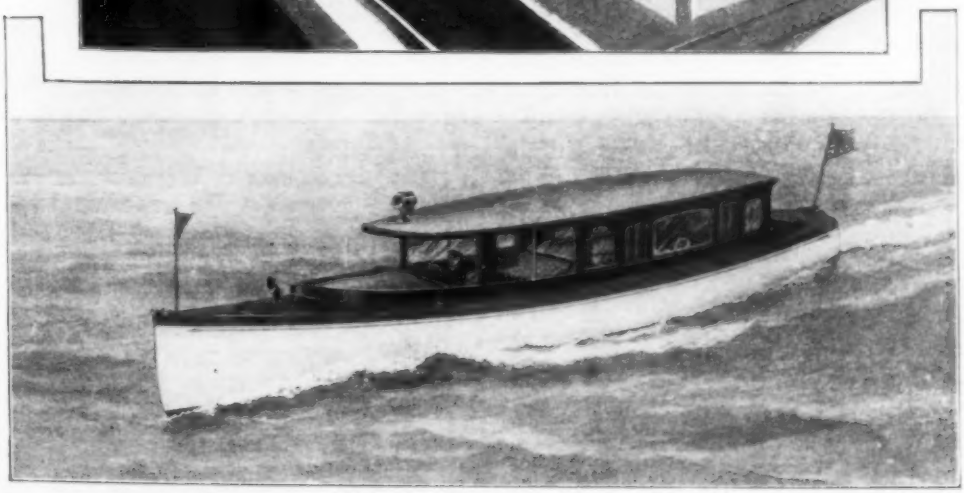
When the marine gasoline engine was first developed there were but two types of pleasure craft using it. These were the regulation motorboat, or launch, and the auxiliary sail yacht—that is, a sail yacht equipped with a small engine by the power of which it could make three, four, or five miles an hour, should the wind leave it becalmed. This year sees a new class developing, a class that will be known, not as auxiliary sail yachts, but as auxiliary motorboats. One of the illustrations shows just such a craft built in England. It is a raised-cabin cruising motorboat of the sea-going type, equipped with a powerful engine for ordinary service, but provided with an auxiliary yawl-rig for emergency.

The spread of canvas is sufficient to carry her along at a good sailing speed should the engine break down or the owner forget to provide enough gasoline. In the last couple of years raised or trunk-cabin motorboats have now and then been provided with a light military mast and a few square feet of canvas, but the English boat is one of the first pleasure craft of the kind with enough sail to be worthy of consideration as a distinct type.

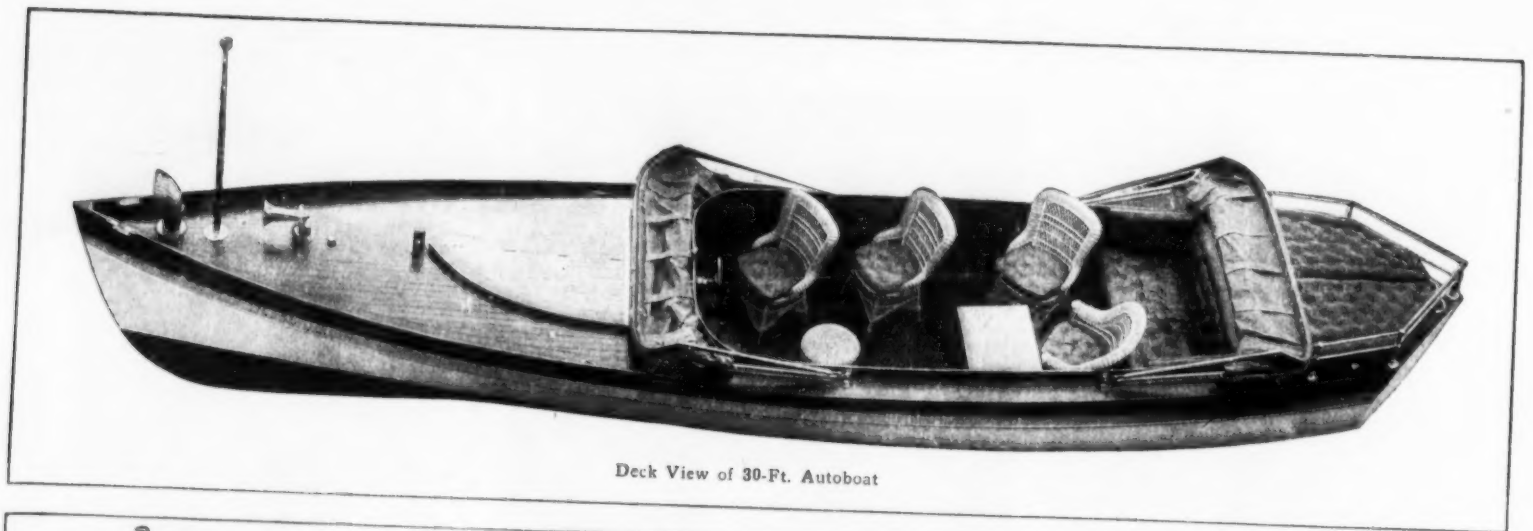
The prices of motorboats as they are built today range from $75 to $40,000, and even the latter figure is not the limit by any means. In size, they range from the 14-ft. rowboat with a detachable engine and propeller dropped over the stern, to palatial cruisers over 100 ft. long. In between are 16-mile-an-hour canoes, in which light 30-hp. engines are installed; little 16-ft. launches selling at anywhere from $100 to $200 and $300, and a multitude of racing craft, open and closed launches, automobile boats, motor-dories, glass-cabin launches, and trunk and raised cabin cruisers. Probably the most satisfactory types of boat for the man of moderate purse are an open boat of from 21 to 30 ft. in length, costing anywhere from $400 to $2,500, according to finish, equipment, horsepower, and arrangement of power plant; and raised cabin cruisers from 32 to 50 ft. in length, with sleeping room for anywhere from two or three to seven or eight persons. Such a raised-cabin cruiser as is shown in the illustration, is usually provided with two lower and upper berths on each side of the cabin forward. The lower berths are used as seats during the day, and the upper berths drop back against the sides. At the rear of the berths on one side is a toilet cubby, and on the other side an oil stove for cooking and a drop table top. The engine is usually placed at the back end of the cabin, or under the cockpit floor. The cockpit is roomy, and can be utilized for sleeping purposes at night by using an awning and side curtains. A 32-ft. cruiser of this type would cost anywhere from $1,200 to $3,000, according to horsepower and fittings, and the price advances as the 50-ft. length is approached. Several concerns are building sea-worthy and comfortable little cruisers of 28 ft., with a speed of about eight miles an hour, for about $850. This figure would easily reach $1,000 when equipped with cushions, and the necessary accessories, but it is just such a boat as this that the young boating enthusiast with a few hundred dollars in the bank is dreaming of.

The first consideration in buying an ordinary motorboat is not speed, but seaworthiness, and the second is comfort. A few years ago the motorboat

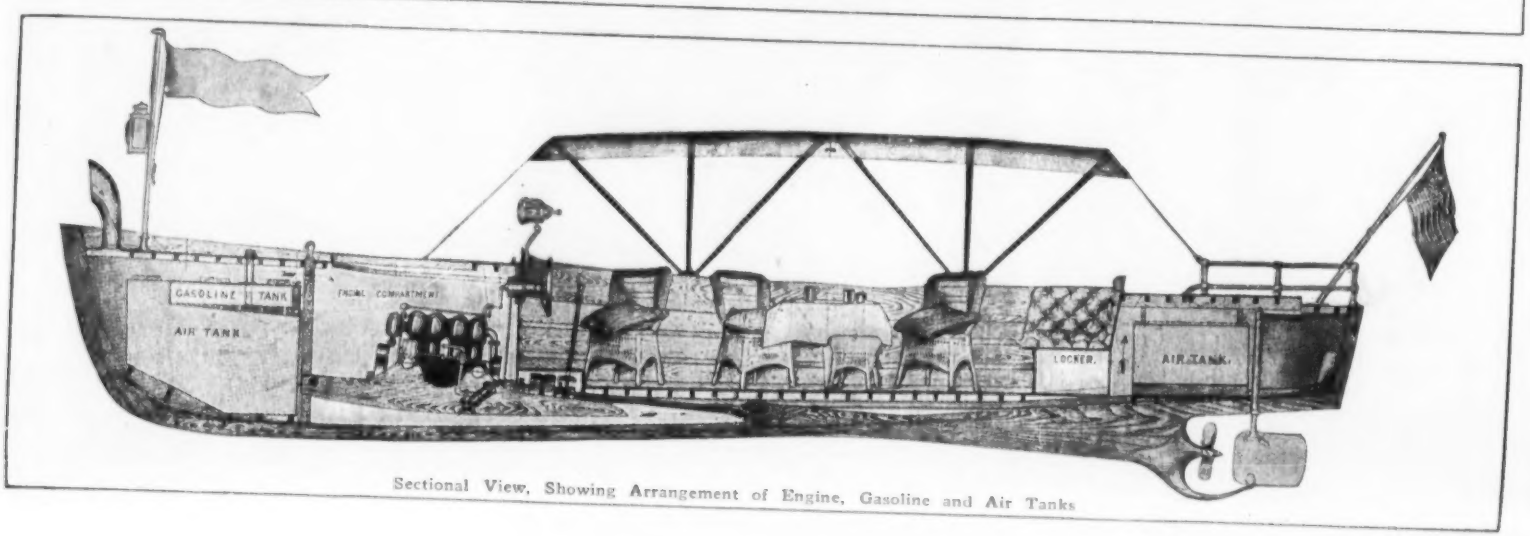




Medium Priced 22½-Ft. Boat; Speed 11½ Miles—Steering and Control Mechanism of Autoboat—Luxurious 40-Ft. Water Automobile; Speed 18 Miles



Deck View of 30-Ft. Autoboat



Sectional View, Showing Arrangement of Engine, Gasoline and Air Tanks

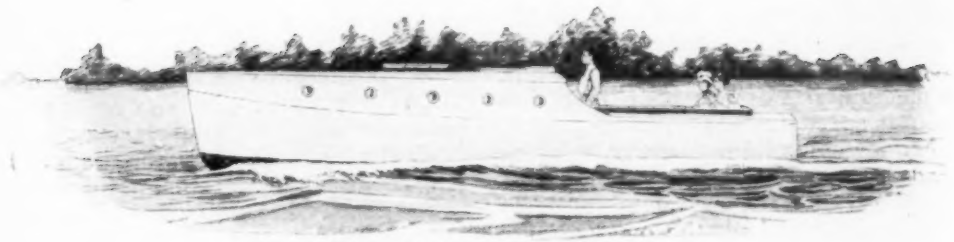
was either seaworthy and slow, or fast and dangerous in a storm. Boat builders, however, have now evolved a type of medium sized open boat that has enough speed for the average person, is comfortable and seaworthy, and has good lines. The latter is something that the craft, built for racing purposes only, has never had, the overhanging, bulging stern being hideous from an artistic standpoint. An example of a fast yet comfortable and seaworthy craft is shown by the illustration in which a man and a little girl are behind the steering wheel. It is a 22½-ft. boat, fitted with a 10-hp. engine, and capable of 11½ miles an hour. The same boat, 28 ft. long, with 16-hp. engine, makes a speed of 14 miles. The 22½-ft. size sells for $650, and the 28-footer for $1,500, and the jump between these prices demonstrates the cost of additional power and speed. For an additional length of 5½ ft., 6-hp., and 2½ miles of speed, the purchaser must pay an additional $850, or more than one-half again the price of the 22½-ft. boat. The engine of these boats is under the forward deck, completely shut away, but accessible through hinged doors.

Probably the best sea boat of any of the smaller types is the motor-dory, one of which is illustrated. It is a 20-ft. boat with a little cabin in the stern to inclose the 4-hp. motor, and attains a speed of 7 miles an hour. It rides a sea that would swamp a craft with the ordinary type of hull. The dory type is used to a great extent on the Atlantic coast and is one of the few small motorboats that is safe to operate on an open sea. The over-hanging bow and stern are shaped like those of the sailing dory, with which Atlantic fishermen have weathered so many storms in the past.

The height the motorboat industry has reached in the construction of what is known as the automobile type of craft is well illustrated by the reproduction of the glass-cabined auto boat, and the open auto boat, of which a sectional view is also shown. The former was specially designed for express service between a railroad station and a country or summer club across an inland lake in the east. The glassed-in main cockpit gives the body an appearance like that of a limousine automobile. Its length is 40 ft., the beam 8 ft., and its 6-cylinder 75-hp. engine drives it at a speed of 18 miles an hour, which is exceedingly fast for a boat of its size. Such a craft serves on water as an automobile serves on land. A similar boat, with the equipment shown, would cost between $8,000 and $10,000.

The open automobile, shown by two illustrations, is a 30-ft. boat attaining a speed of 12 miles an hour with a 25-hp. engine. Its price is $2,500, and it has many interesting features. The engine is under a hood near the bow and rests on its base in such manner that it can be tilted up on end when it is necessary to make adjustments inside the crank case. It tilts on the forward raise in its foundation, which may be seen by glancing at the sectional illustration. To start the engine requires a slight push forward of the steering wheel and a turn to the right. The forward motion disconnects the steering wheel from the steering gear and connects it directly with the motor shaft through chain and sprocket. The moment the engine starts, the wheel is automatically disengaged from it and is ready for steering. The cockpit is sufficiently large for four or five wicker chairs and a table and at the rear end is a wide automobile seat. A padded-leather mattress is also provided for the after deck, which can be used for lounging.

The largest motorboat on the Pacific coast is the 97-ft. craft which will be turned over to William E. Boeing, of Seattle, sometime in May. Its extreme width is 16 ft. 6 in., and its draught is 5 ft. 9 in. The lines are fair and easy, running in an unbroken sweep from stem to stern. She has graceful and liberal freeboard, and shows much power and seagoing qualities throughout. The deck is virtually flush, extending in an unbroken sweep from the stem for a distance of about 63 ft., where it drops 15 in. on each side



Medium-Sized Raised-Cabin Cruiser

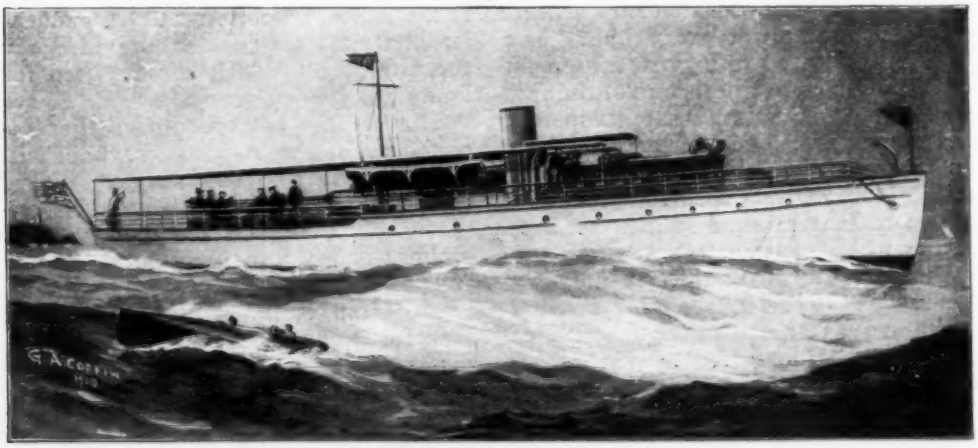
for a width of 27 in., leaving a central trunk-cabin effect which gives excellent ventilation, and does away with the high and boxy appearance of the stern that is noticeable in some flush deck power boats. The motive power consists of two 6-cylinder engines, developing not less than 100 hp. each, which will give the vessel a speed of 16 miles an hour.

She is to be used for extensive coastwise as well as deep sea cruising, and will make a trip to Alaska, then across to the coast of Siberia and down the Asiatic coast. The interior arrangement of such a gasoline-driven yacht as this is interesting.

The deck house is fitted up as a dining room. Aft on the starboard side are three steps leading up to the main deck, and opposite, on the port side, is a small refrigerator 3 ft. in height. In the forward end of the deck house is a buffet and sideboard, all finished in teak, with drawers and lockers for cutlery, silver, etc.

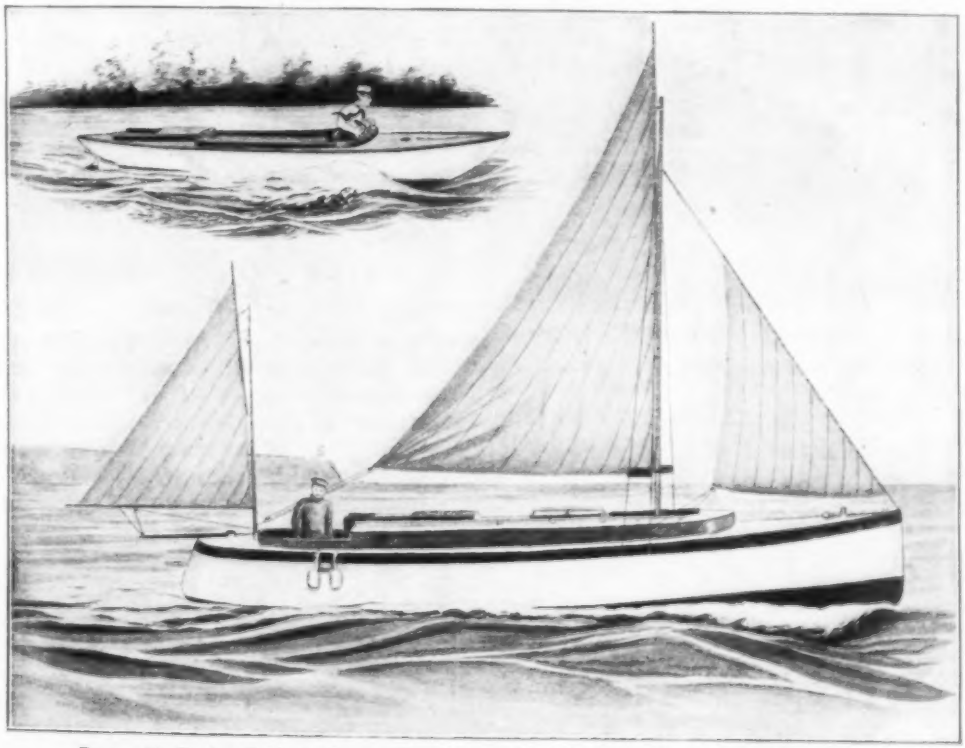
There are five steel bulkheads, dividing the vessel into six watertight compartments. Immediately abaft the collision bulkhead is the captain's stateroom, fitted with berth, bureau, lavatory and large wardrobe. Aft of this, on the starboard side, for a distance of 13 ft. in length, is the forecastle, extending 12 in. across the center line of vessel, and fitted with berths, lockers, and folding table. Opposite, on the port side, is the engineer's stateroom, with berth, wardrobe and bureau, and forward of this a toilet room, 4 ft. in length, fitted with closet, wash basin, and open plumbing.

Next comes the galley, 8 ft. 6 in. in length and extending the full width of the vessel, fitted with stove, dresser, sink, dish racks and closets. On the port side is a large refrigerator, having a cold storage space of over 100 cu. ft. The yacht is equipped with a refrigerating plant, so that the owner will be entirely independent of the ice supply problem.



Largest Motorboat on Pacific Coast

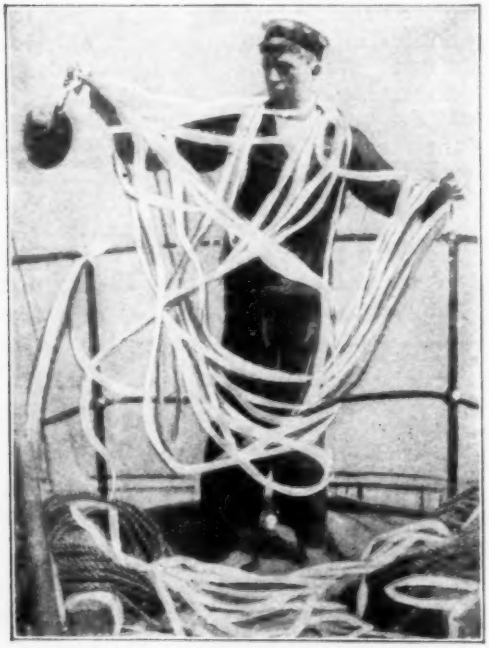
Immediately aft of the galley is the engine room, 12 ft. 9 in. in length, and extending full width of the vessel. This space is enclosed in steel watertight bulkheads. Aft of the gasoline tank is a steel watertight bulkhead, immediately behind which is the owner's stateroom, 8 ft. in length and extending the full width of the vessel. On the starboard side is a double brass bed, on the port side a sofa with drawers under, and forward amidships a mahogany chiffonier. On the port side, aft of this stateroom, and connecting with it is a large wardrobe, and on the starboard side a toilet room, fitted with porcelain basin and closet, and nickel-plated open plumbing complete. Aft of this is the steerage on the starboard side, and opposite this on the port side a single stateroom, with berth, divan, bureau and wardrobe complete. Aft of this port stateroom is a toilet room, and abaft of this a bathroom, with porcelain tub, lavatories, closets, and nickel-plated open plumbing complete. Opposite this bathroom on port side is a single stateroom, with wardrobe, divan, bureau, etc. At the after end of the vessel and communicating with the steerage by a passage of 27 in. in width, is a double stateroom, 9 ft. in length, extending full width of the vessel, fitted with a large bureau, two single berths, two sofas and two wardrobes, with all furnishings and fixtures complete.



Dory with Engine Cabin in Stern—New Type of Motorboat Having Yawl-Rig for Wind Power

A PENNANT ANNOUNCING PAY-DAY

When the H. M. S. "Terrible" arrived home from China recently she was flying a curious pennant that stretched far out over the stern from the after-mast and trailed in the water. At its end was a golden bladder, which floated all the way to port. It is the old-time signal flown by a home-coming ship, and is known as the paying-off pennant. The bluejacket in the il-



Golden Bladder and Many Yards of Pennant

lustration has just finished hauling the pennant in.

¶An American company proposes to construct a 40-mile electric railway in Ecuador.

CHINA FEARS HALLEY'S COMET

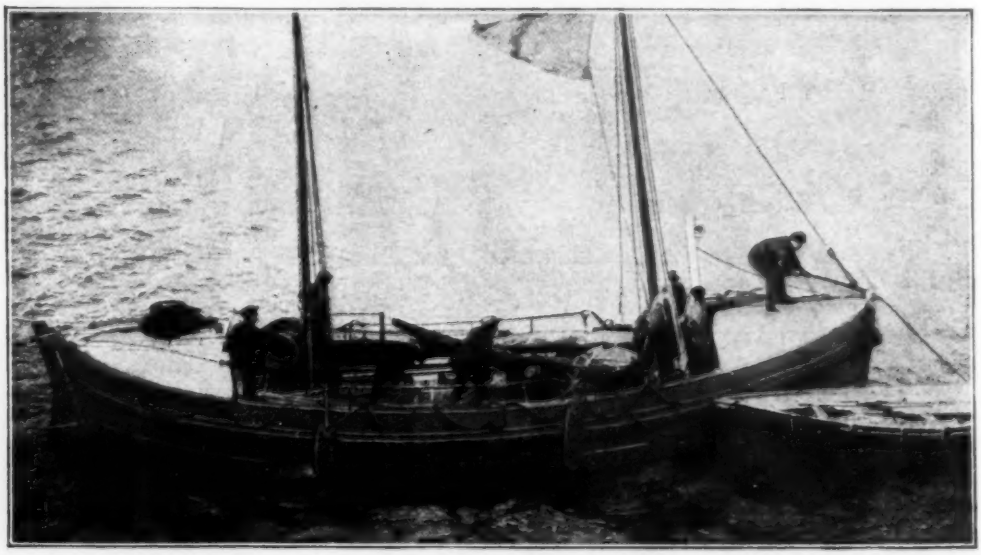
The appearance of Halley's comet is viewed with considerable apprehension by the government officials of China, because of the influence it may have over the masses. Through one of those inexplicable popular delusions, which take their origin no one knows how, the teeming millions of China have been in a highly excited condition. They have the impression that the foreign powers are preparing to break up their country, and that a force of 60,000 French soldiers is ready to begin the attack.

The Chinese officials are said to fear that the sudden appearance of the comet, added to the already tense feeling, would inspire terror which might cause an outbreak.

MOTOR-DRIVEN ENGLISH LIFEBOAT

The lifeboat shown in this illustration is a powerful motor-driven craft for duty on the coast of Wales. Its station is at Fishguard, the Welsh port by which one of the trans-Atlantic lines now makes connection with London.

Like the American motor-driven life-



Motor-Driven Lifeboat on Welsh Coast

boats, the engine of the English craft is incased in an airtight box, but in point of size it is considerably larger, and has two sail-carrying masts. The tests of the boat, all of which were successful, required its capsizing and an immediate starting of the engine again the moment it was righted. The starting of the engine after the boat has capsized is accomplished by the turning of a starting handle.

CONCRETE SAIL BOATS

The concrete sail boat in the illustration is only a model, but from it a contractor in Sandusky, Ohio, expects to build practical sail boats 20 ft. and more in length. In making the model, he formed a skeleton of the hull and decks with a fine wire mesh, bracing the wire with heavy pasteboard. He then plastered the outside, and, after allowing the mixture to dry, removed the pasteboard and added the interior coating. In this way he embodied the wire mesh in the cement and secured a thickness of hull of only one-fourth of an inch. The model is provided

Model of Concrete Sail Boat

with a double bottom, which forms a watertight compartment sufficient to float the craft even though the cockpit should fill with water.

TRADING SCHOONER PROVIDED WITH MOTOR

A 100-ton schooner, the "North Barrule," trading out of Liverpool, has

Six Miles an Hour with a 28-Hp. Auxiliary Engine

been provided with a 28-hp. gasoline engine which enables her to make a speed of about six miles an hour when fully loaded. The engine more than pays for itself in the saving of harbor towing charges, and the vessel leaves port independent of wind or tide. Sometimes she even tows out a sister ship, which otherwise would be delayed by waiting for a favorable wind.

MOVING PICTURES OF MICROBES IN ACTION

By the co-operation of scientists and moving-picture experts we can now see the microbe as it goes about its never ending work of good or evil. Moving pictures of different ultramicroscopic scenes will be of vast benefit, not only as an admirable method of study, but as an aid in research work. The conflict between the microbes and the blood corpuscles is depicted in a startling manner, and when thrown on a large screen some virulent destroyers appear a foot in length.

A STORE ON A LINER

An Ocean-Going Store

The trans-Atlantic liner "Lapland," of the Red Star line, has been provided with a little shop or notion store, stocked with all sorts of goods likely to appeal to the passengers. The stock includes caps, sweaters, gloves, stockings and hose, scarfs, flags and banners, writing materials, books, a good assortment of such little pieces of bric-a-brac as brass candlesticks, copper trays and vases, pottery and china, and many other things useful and ornamental.

Like a store on land, it is also provided with a show window.

MOTORCYCLE MAIL VEHICLE FOR RURAL ROUTES

This ingeniously constructed motorcycle is used for rural mail delivery on one of the routes out of Sittingbourne, England. The motorcycle is of the 3-wheel type, with running-boards for the operator's feet, instead of pedals. Over the forward wheels is a large compartment for articles sent by parcel-post, and letters. The top is railed and accommodates mail bags. Mounted over the rear wheel is a wicker holder which forms a back-rest for the operator and a place for the storage of more mail and packages. The steering mechanism is like that of an automobile.

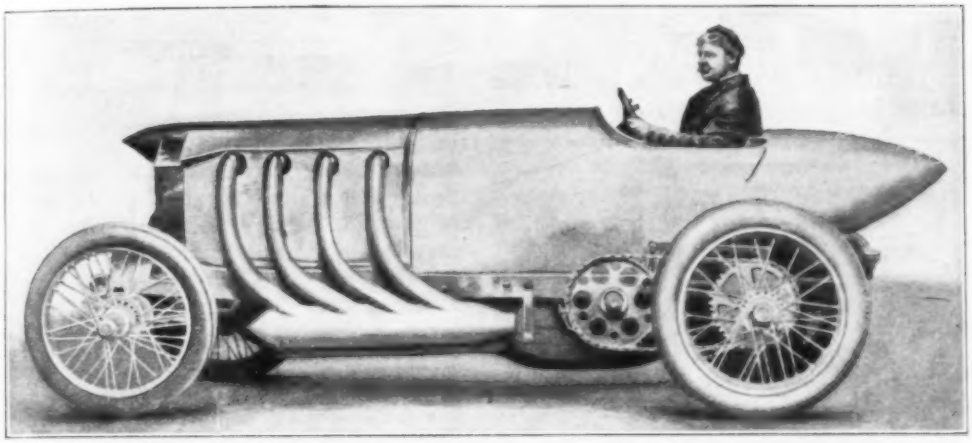
An English Motor Postman

LOCOMOTIVE TOOTS ITSELF "DEAD"

One of the strangest accidents in the records of railroading in the United States happened recently at Bullard, Cal., when a locomotive on the Southern Pacific tooted itself out of steam because of the inability of the engineer to stop the whistle.

In some manner the lever that operates the whistle got out of order and could not be controlled, nor could any repairs be made. The locomotive was hauling a long freight train. Suddenly the whistle began to shriek and nothing that the engineer could do would stop it. The whistle kept at it until the steam became so low that a new engine had to be brought from Fresno to take its place. Then they towed the still tooting engine to the repair shops.

¶Dr. Harvey W. Wiley, the government food expert, has made public a simple method of testing the freshness of eggs. If an egg sinks in a solution of one ounce of salt to ten of water it is fresh.



Covered Mile in 27⅓ Seconds.

THE FASTEST MILE EVER TRAVELED BY A HUMAN BEING

A mile in 27.33 seconds.

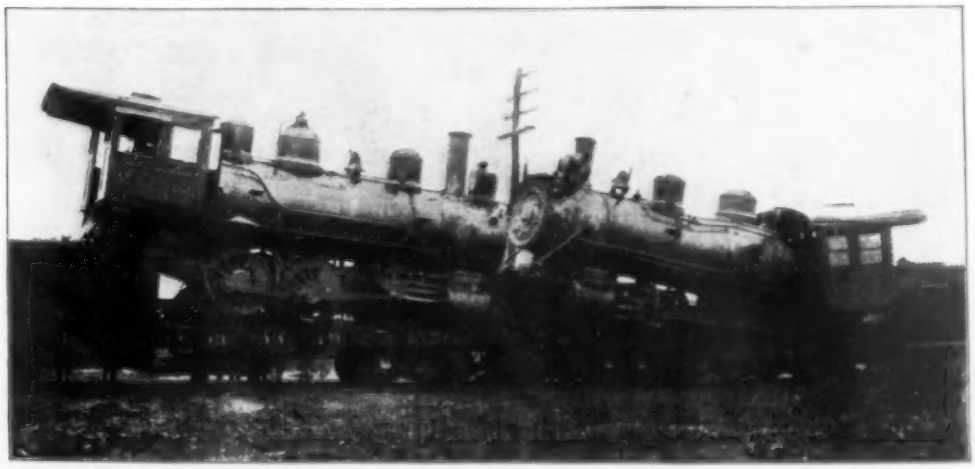
This was the record breaking speed made at Daytona, Fla., recently by Barney Oldfield, the famous automobile driver, with the Benz car shown above.

This means traveling at the rate of 131.76 miles an hour. At this speed the globe could be encircled in less than eight days. And it would be possible to go from Chicago to New York in eight and a half hours as compared to 18 hours, train time.

The car in which Oldfield made the record was already the holder of all the world's short distance speed records.

LOCOMOTIVE LANDED ON FLAT CAR BY COLLISION

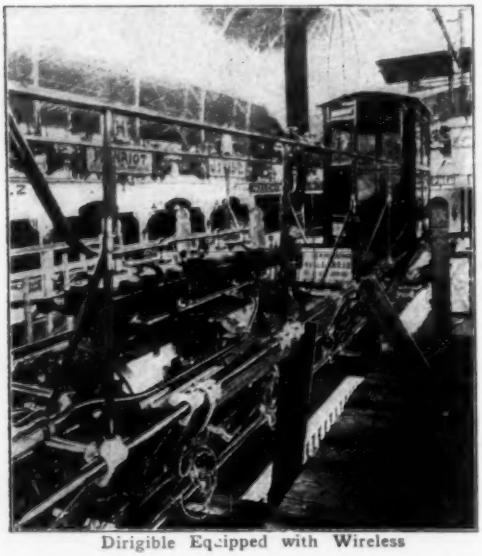
A locomotive was driven over one flat car and landed on another as neatly as if intentionally loaded there, by a head-on collision between two freight trains in the yards of the New Orleans and Northwestern railroad at Hattiesburg, Miss. The flat car on which one of the locomotives came to rest was only slightly damaged, consequently it was hauled away with its load to a siding, where the engine was again placed on the rails. Half of the wreck was in this way removed from the scene without the service of a wrecking crew.



Locomotive Landed by Collision in Position for Immediate Removal

WIRELESS STATION OF AIRSHIP

Just forward of the motor of the dirigible "Belgica," recently on exhibi-



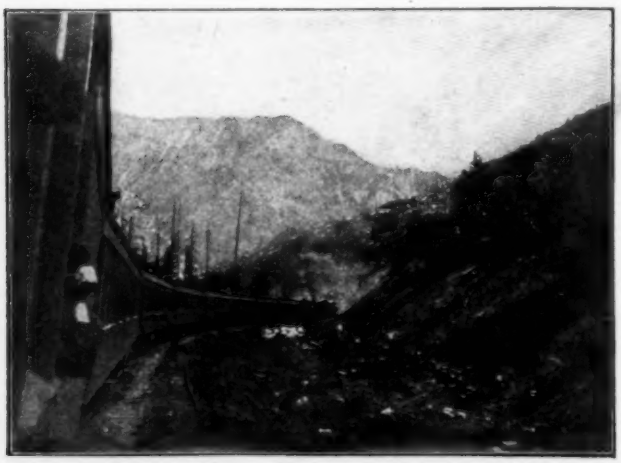
Dirigible Equipped with Wireless

tion at the Paris aerial show, is a wireless telegraph cabin not unlike a telephone booth in appearance. The fact that the wireless apparatus was thus protected, while the engine was left exposed, was the cause of much comment, but the inclosing of the wireless is not only for its own protection, but to protect the gas envelope from electricity.

MOVING PICTURES SHOW THINGS GROW

The means by which the growth of the orange tree or any other plants may be witnessed in moving pictures is accomplished by what the operators designate as "trick work." The flower or plant is actually photographed, but at various stages of its growth. If it is a fast grower a "run" of films is taken every day until it is matured, but if its progress is so slow as to be imperceptible from day to day, a longer interval is allowed to pass. When the work is complete the various strips of film are pasted together and run through the machine at such speed that the plant grows up, blooms, and puts forth its fruit before the eyes of the spectator.

A film of this kind is necessarily expensive, and requires a long time to produce. The department of agriculture has two films which are now being shown to western farmers. One of them is on the breeding of chickens and the other on the growing of wheat. The latter is especially unique, as it shows two stalks of wheat growing, from the moment they break through the ground until they reach full height. One of them is the result of a good seed, the other of a bad one, and the difference in strength and value is clearly shown by the two examples.



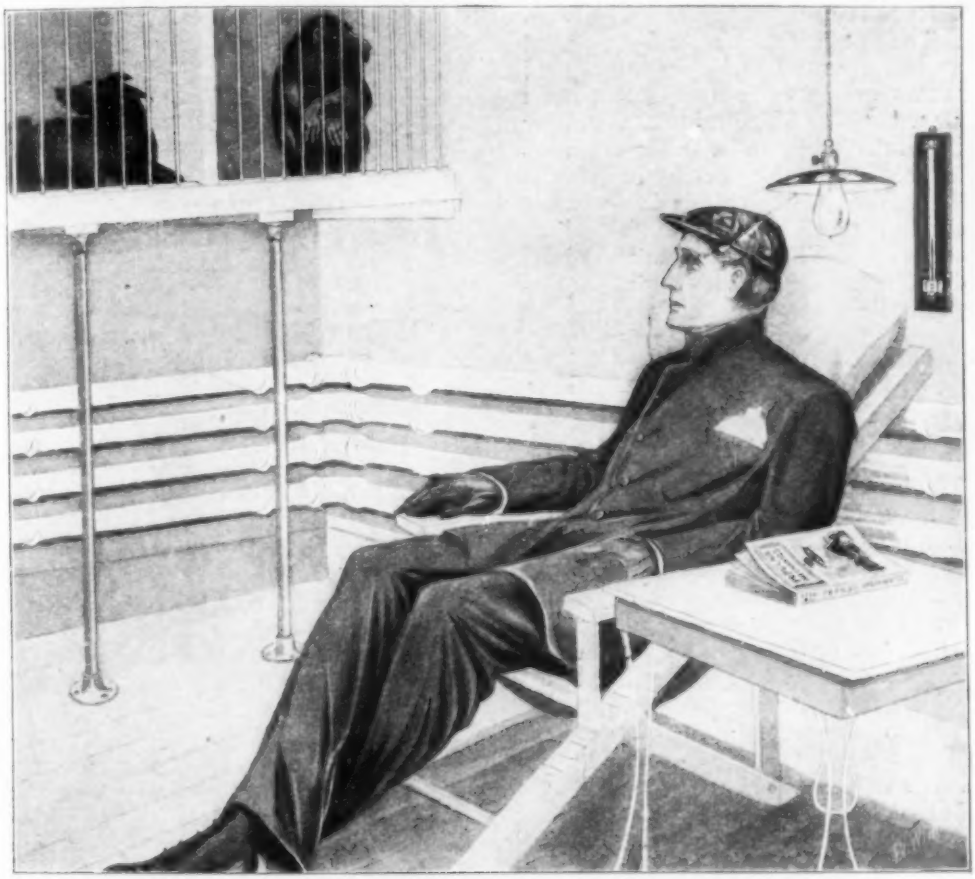
Turn Magazine So Left Side Becomes Bottom

TRAIN LOOKS LIKE EIFFEL TOWER

By turning the magazine so that the left side of the accompanying illustration becomes the bottom, the train presents an appearance very much like that of the famous Eiffel tower of Paris. To get the best effect the page should be held about 20 in. from the eye, with the rear of the train covered. The train is on a curve of one of the mountain sections of the Canadian Pacific railroad.

THE COLD CURE FOR SLEEPING SICKNESS

Most of the experiments for fighting that peculiar disease known as the "sleeping sickness" have heretofore been carried out in Africa, where it is prevalent. Sir Edwin Durning-Lawrence, a famous English physician, ordered a refrigeration plant, and installed it in a hospital ward. The room is painted white, devoid of carpet, but made comfortable with a table, a deck chair, and an electric light. The patient who submitted to



The Victims of the Sleeping Sickness Undergoing the Refrigeration Treatment

recently suggested that if the parasites, even when they have entered the blood of a human being, are removed from the warm climate where they start their deadly operations, and are transferred to a climate of an extremely opposite character, they might by this simple operation be annihilated.

The Liverpool School of Tropical Medicine, taking up the suggestion, the treatment sits for hours at a time in the "ward," which is kept at a temperature of from 10 to 20 degrees below freezing point. The room is 12 ft. by 9 ft., and has double wooden walls, the space between being packed with cotton.

A number of animals, also suffering from various diseases, and being subjected to experiments, occupy cages

along the wall, and when the sleeping sickness patient tires of reading he spends his time watching his companions in misery. His greatest effort is to keep awake.

If this method of treating the sleeping sickness is successful, it would mean the establishment of huge refrigerators at all the European stations in tropical countries where the disease is prevalent.

The plant consists of an electric motor driving a two-cylinder, single-acting ammonia compressor of the enclosed type. The ammonia expanding into coils in a tank containing brine, cools the brine to about 6 deg. F. The brine is conducted through the room by pipes attached to the walls. There is a small glass window in the door, and a glass light in the ceiling.

MOTORBOAT RACE FROM PHILADELPHIA TO HAVANA

The first open-ocean motorboat race from Philadelphia to Havana, under the direction of the yacht clubs of those cities, will start on May 21, and will probably be entered by a large number of staunch sea-going motor cruisers. No unseaworthy boat will be permitted in the race, and various regulations have been set down that will tend to give the entrants a safe passage.

The course is about twice as long as that of the famous New York to Bermuda course, but at no time will the boats be over 100 miles from a harbor, and they will always be in the track of a large amount of shipping, so that the contestants will be constantly reported by wireless and otherwise. The length of the race will be approximately 1,200 miles, and will take from five to six days.

The prizes include a first prize of a cup valued at $1,000 and $1,000 in cash, a second prize of a $500 cup and $500 in cash, and a third prize of a cup valued at $250 and $250 in cash. The boats contesting must not be more than 100 ft. long over all, or less than 50 ft. over all.

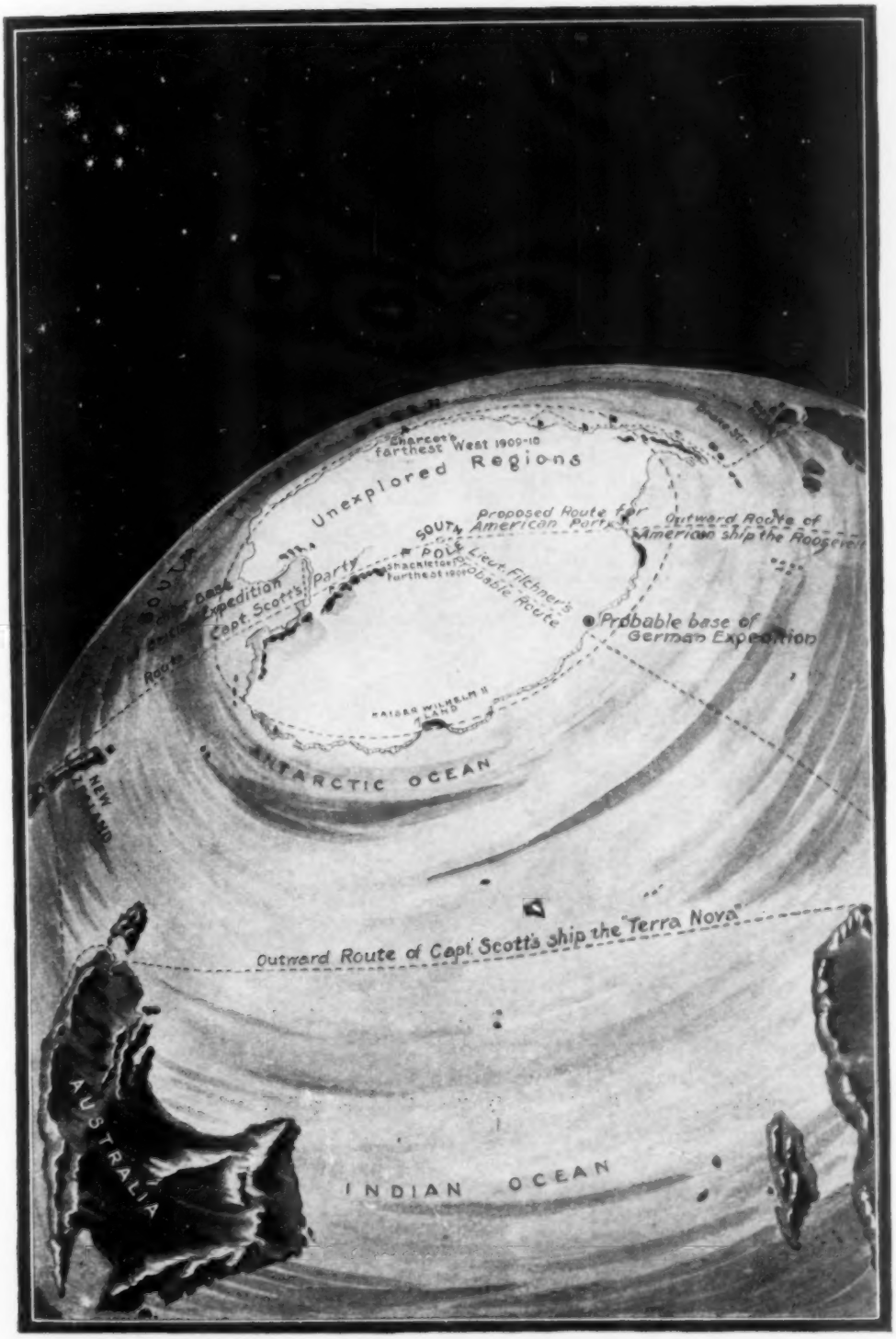
THE THRILLING RACE TO THE SOUTH POLE

Until a few months ago England expected that its Antarctic explorer, Captain Scott, would have no rivals in his approaching attempt to reach the South Pole, and the British public was not specially roused with enthusiasm. But the announcement that an American expedition would break into the southern ice field in a simultaneous attempt has added greatly to the interest in the preparations of the British expedition in all parts of the world. Add to this the fact that Lieut. Filchner is preparing to lead a party of German explorers southward and it is clearly understood why Commander Peary says the race will be the most exciting and nerve-racking the world has ever seen.

The dash for the pole has now taken to itself the glamor of a great sporting event, in the best English sense of the word, and the chief feature is not just getting there, but getting there first. Captain Scott, having explored the Antarctic regions before, and taking the same route this time, will have an advantage.

The American expedition will not take a route already traversed by Antarctic explorers, but will start from the opposite side from that to be taken by Captain Scott. No one has ever landed at the point where the party of American explorers expect to start on their dash over the ice and snow. Indeed, no one has even seen land there, although there was an ice cliff, 150 ft. high, which was called land.

Captain Scott will sail from England in June, and after wintering at McMurdo Sound will start October, 1911. He hopes to reach the pole by December, 1911. The Americans, starting from a base in Coats Land, also hope to reach the pole by December, 1911.



The Routes Which Will Probably Be Taken by the Rival South Pole Expeditions

How Cleveland Helped the Small Boy to Enjoy Independence Day Without Firecrackers

The Knell of the Firecracker

By JAMES R. QUIRK

ON the coming Fourth of July scores of children will be killed.

Some of them will meet death in one of its most terrible forms—tetanus.

Hundreds of others will be injured, many of them maimed for life.

Thus the American people will express their patriotic enthusiasm on the anniversary of the signing of the Declaration of Independence. Would not some of the signers of the immortal document have hesitated, and shaken their heads sadly as they attached their names, had they been able to peer into the future and look upon row after row of little tombstones, monuments to a barbarous method of celebrating our national birthday?

We are today opening our eyes to the fact that it is time for another declaration—one that shall rid the day we celebrate of greater carnage than has marked many famous battlefields. The deadly firecracker and the treacherous toy pistol must go, and the day of dynamite patriotism must give way to a day of sane and civilized patriotism.

It is a safe prediction that in five years the dangerous toys will disappear as an American institution. This does not mean that the enjoyment of the day will be diminished. Rather it will be increased, and made to extend to thousands of people to whom the Fourth of July as it is celebrated today means twenty-four hours of constant dread. A healthier patriotism will be the result.

Many cities of the country have during the past year made ordinances either prohibiting or regulating the sale and use of firecrackers. These cities have been influenced to action by the happy results secured by municipalities whose citizens were pioneers in the movement. In many cases the legislation was due to the work of small groups of public-spirited men and women, organized to urge the passage of laws putting an end to the annual slaughter of the innocents. Chicago, Baltimore, Cleveland, Washington, Toledo and San Francisco have blazed the way, and the lives of many children have been saved.

As a result of the action of the Commissioners of the District of Columbia, aided by the business men of Washington, not a serious injury was reported last year. Chicago also made a good showing. Up to last year the inland metropolis contributed a heavy list of dead and injured to the toll. On July 4, 1908, 12 persons were killed by burns or explosions or died from tetanus as a result of firecracker celebration, and 202 were injured. Last year, following the passage of an effective ordinance, there was not a single death, and the number of injured was reduced to 118. Seven children were killed in New York City and 559 injured, while Philadelphia headed the list with nine deaths and 508 injuries. At Lawrence, Mass., which has a population of 71,548, about one-twenty-fifth of the population of Chicago, five persons were killed. In all 215 persons were killed on July 4, 1909, and 5,091 were injured, twelve times the number of patriots killed and wounded at the battle of Bunker Hill.

Of scores of letters to the writer from mayors of large cities there is not one that defends the present method of celebrating. It is only reasonable, therefore, to say that, municipal authorities all over the country being aware of the danger incident to the folly of what may be called pyrotechnic patriotism, future death and injuries from that cause may be charged to the indifference or neglect of local authorities.

The nation-wide scope of the feeling on the subject may best be shown

Willie Jones Thought the Fuse Had Gone Out

by these extracts from some of the letters:

Mayor P. H. McCarthy, of San Francisco, writes:

I am convinced that the celebration of the Fourth of July with powder and fireworks is a mistake. In the zeal of their patriotism the American people have gone beyond all reasonable limitations. The life and limb of one small boy is worth more to this nation than the combined noise and cheers of our population. I do believe that a sensible plan should be adopted whereby the firecrackers, bombs, torches, sky-rockets, etc., could be gently withdrawn from the hands of our youths, and the celebration of the Fourth of July made the occasion of more rational enjoyment. We might even then increase our general spirit of patriotism.

Brant Whitlock, the energetic mayor of Toledo, O., claims for his city the honor of instituting the "sane Fourth" idea. He says:

Toledo instituted the sane Fourth idea. Mayor Jones, I think, was the father of the sane Fourth idea in America. In 1904 he succeeded in having an ordinance passed by Council prohibiting the use of explosives, the purpose of which was to insure a quiet day on the Fourth of July. He did not, however, place his confidence in the use of force or penalties, but strove in every way possible to create a public sentiment favorable to a quiet celebration. The Fourth that year was quietly observed; one reason, doubtless, why it was so well observed that year was that Mayor Jones was taken ill and lay dying on that day, and the silence was in some sense a tribute to him. Since then we have not had a noisy Fourth in Toledo. We usually begin several weeks before the Fourth to call the attention of the people to the Toledo method of celebrating the Fourth, and the police are instructed to stop the preliminary celebration which culminates in other places in the hideous noise of the Fourth. Since the year after Mayor Jones' death, I think there has not been even a slight injury from the use of fireworks in Toledo, nor has there been a fire; on one of the Fourths since that time the department did not make a run. So we think we have a sane Fourth established in Toledo, and also that we are entitled to the credit of being the pioneer in the reform.

Mayor John F. Fitzgerald, of Boston, hits the nail on the head when he says:

It is hardly practicable to take away from the children one form of pleasure without giving them something in its place which they will regard as an equivalent. In many cities, especially in foreign countries, pageantry is becoming a fine art, and it seems to me that nothing would enlist the interest of a larger number of people, and do more to awaken patriotic fervor than a magnificent parade, including civic and military features, through the streets of each of the large American cities. No feature of the Hudson-Fulton celebration was, I believe, more conspicuous than the procession which passed under the arches of triumph.

Jacob Haussling, Mayor of Newark, N. J., has stirred things up in that city. Newark will have a sane Fourth for the first time this year. The mayor says:

I am most heartily in favor of the movement for a "safe and sane" celebration of the Fourth of July. I advocated in my last annual message a change in the custom heretofore pervailing, and a committee of the Common Council is now engaged in formulating plans for a pageant or public show to take the place of the old form of celebration.

It is obvious that any action to prevent the present annual slaughter must be constructive. The treatment of the case must be gentle, not drastic. Something must be substituted when the firecracker is taken away. Cleveland solved the problem last year, and a permanent form of celebration, as big and distinctively characteristic of the city as the Mardi Gras festival is of New Orleans, is the aim of the civic organization which made a success of the sane Fourth last year. An attempt is being made to repeal the anti-fireworks ordinance, but the civic organization, headed by Prof. J. E. Cutler of Western Reserve University, are fighting for the law, and undoubtedly the attempt will fail. Thomas D. West, a prominent manufacturer, and president of the American Anti-Accident Association, was one of the prime movers in the Cleveland sane Fourth movement.

By the terms of the ordinance every display of fireworks is entrusted to the director of public safety, and is conducted either under his direction or under his supervision. The only display of fireworks in Cleveland last year was that given in the evening by

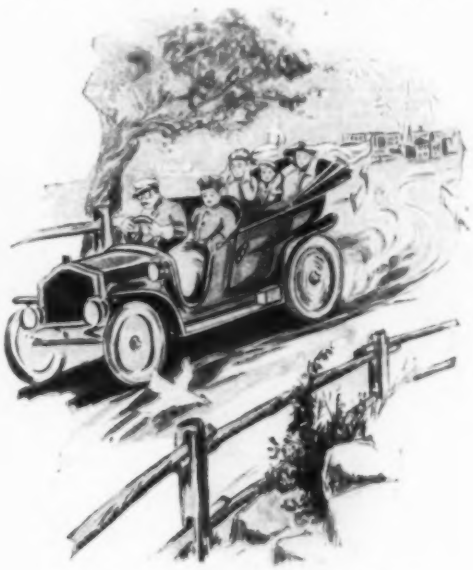
authority of the City Council. Other than that no gunpowder of any form was used in connection with the celebration of the day. As a result there was not a single death or accident in the city, as compared with 12 deaths and 45 injuries the year before.

A citizens' committee was formed, known as the Fourth of July Carnival Committee. This committee organized a children's parade for the morning which was unique in many ways. Three distinct features characterized the parade: first, a congress of nations represented in the population of the city; second, floats and pageants representing incidents in American history; and third, grotesque and fantastic costuming. Nearly 3,000 individuals took part. There is splendid opportunity, in connection with this form of celebration, for the use of American flags, small balloons, airship kites and balloons in patriotic colors, drums, horns, whistles, bells, and rattles. There was no ban on noise other than that made by explosives.

The sane Fourth movement in Chicago is in the hands of a representative body of men, who, not content with securing the passage of an ordinance to restrict the sale of firecrackers, are planning to give the city a great treat on Independence Day. It has secured for the city the annual tournament of the United States army, and it is safe to say that the small boy will forget all about fireworks in his eagerness to watch the soldiers in their maneuvers, and in keeping pace with the attractions that have been prepared. A monster parade will open the exhibition. The Sane Fourth Association will bear the entire expense which will be incurred by Chicago, about $60,000, covering it by subscriptions. All the leading clubs and civic organizations of the city are co-operating to make the Chicago celebration a model to be followed by other cities.

Both Cleveland and Chicago were urged to take action by the number of deaths caused by firecrackers in 1908. There was not a death in Chicago last year.

Within a few days after the enormity of the number killed on July 4,



Going Out of Town to Escape the Fourth

1908, was known in Chicago, Marquis Eaton, president of the Hamilton Club, called a meeting of representatives of different organizations. The matter of a sane Fourth was discussed and prompt action was the result. The Sane Fourth Association was formed. The wholesale dealers in fireworks were called in, and asked to stop the sale of the more dangerous firecrackers. They explained that the small dealers were already stocked up with firecrackers, etc., and that it would take two years to sell out the supply already on hand. The association did not desire to be radical, and when they framed an ordinance for submission to the city government, it merely prohibited the sale and use of the larger and really dangerous firecrackers and fireworks. The ordinance was not an anti-noise law. It allows the use of the so-called Chinese firecracker, which is usually set off in bunches. But nothing that has explosive power enough to break the skin, thus introducing tetanus and other forms of poison into the blood, is permitted. The association felt that Young America could go ahead and burn his fin-

gers all he wanted,—but he was not allowed to possess anything that would break the skin.

Not content with framing this ordinance, the association stood by and saw it through the City Council. Many a well meaning organization has presented proposed legislation and then considered its work done. The enemies of the legislation are allowed to get in their work and the reform is killed. The presentation of a proposed ordinance is but the beginning. That's why the Chicago association remained until the finish.

In addition to the local organizations which have done effective work in securing the passage of prohibitive and restrictive legislation, there have been other forces at work. The Journal of the American Medical Association has for seven years compiled the list of deaths and injuries due to the celebration, calling attention to the enormity of the numbers.

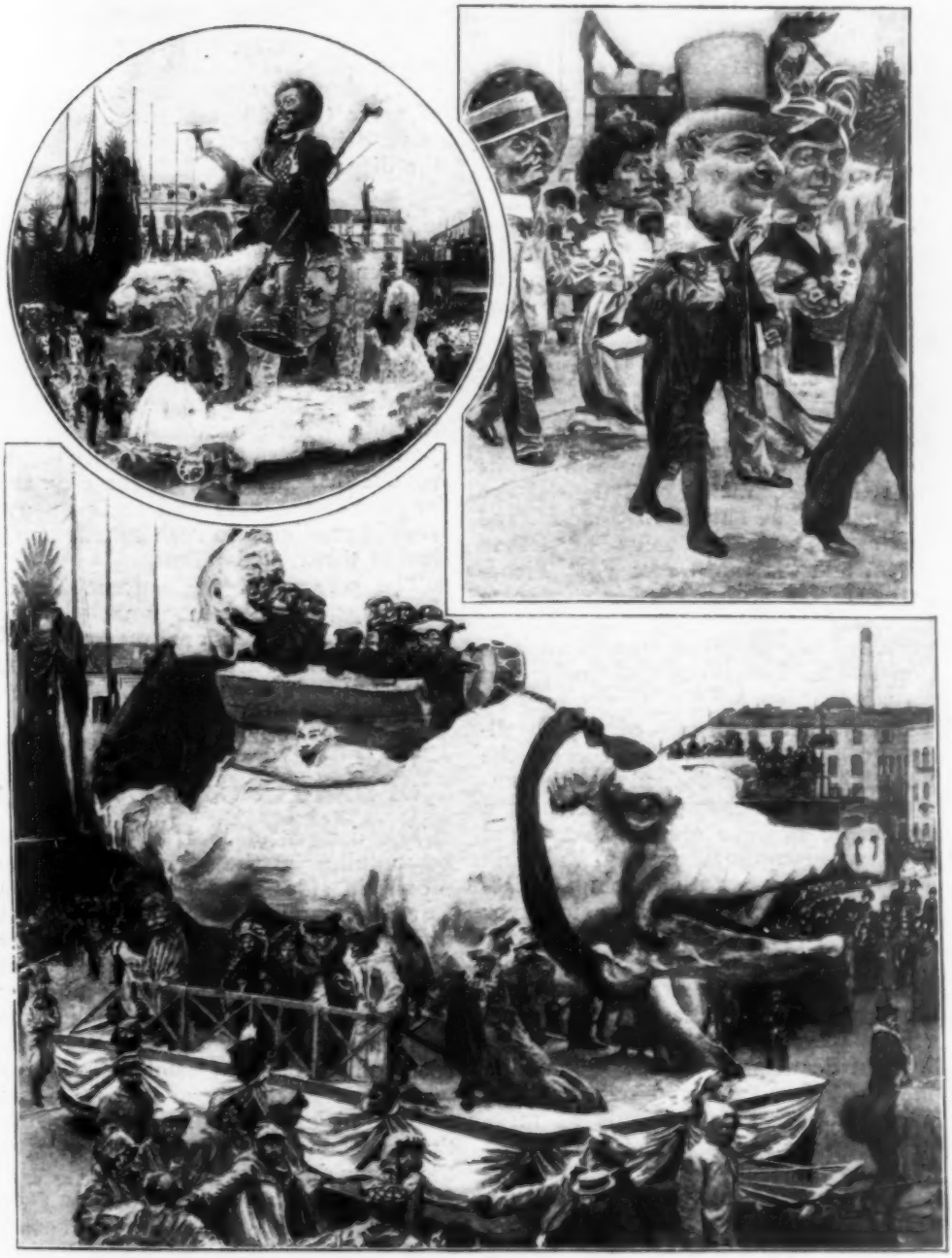
Let us look beyond our own shores and see how other countries observe their national holidays. The Chinese were the first to use the firecracker, but, as in all other things, we wanted to go John Chinaman one better, and so we constructed giant cannon crackers that made his puny product insignificant in comparison.

In Italy the national fetes are great events. Yet there is no incessant booming of firecrackers mingled with cries of agony as children are blinded, maimed and killed.

One of the Winning Groups of Cleveland School Children in the Fourth of July Costume Contest

Processions of grotesque figures now enliven the streets of every Italian city and village on festal occasions. The individuals vie with one another in the making of masques, and the entire day is given over to sane forms of healthy outdoor sports and amusements.

True, the old Romans used to throw victims to the lions of the arena to celebrate their pagan fetes, but such



Italy Celebrates Her National Holidays in a Sane Way—Some of the Grotesque Floats and Figures

modes of celebration disappeared with the advent of Christianity. We are wont to wonder how human beings could be so cruel, and we congratulate ourselves that civilization no longer permits Neros to rule. When you think this again, consider our Fourth of July.

The national holiday in France falls on July 14. It is a day of rejoicing, of parades and reviews. Bells are rung, speeches are made in public places, and the buildings are decorated.

In Germany the school children contribute the principal features of many celebrations, and exercises are held in every school on the nation's gala days, particularly on the Emperor's birthday. Oratory and song are central attrations, and home gatherings complete the joys of the day.

And by the way, what has become of our Fourth of July orator? What has become of the silver-tongued speaker who used to carry his hearers to the heights of enthusiasm as he read the Declaration of Independence and told of the battles of Concord and Lexington, of the valor of Ethan Allen, and his capture of Fort Ticonderoga? He still holds forth in some communities where the real spirit of the day has not given way to an irrational idea of celebration by noise and carnage.

Every year thousands of city dwellers go out of town "to escape the Fourth." That is indeed a sad commentary on the manner in which as a nation we observe our great national holiday. Hospitals dread it, for in many cases the noise of exploding firecrackers throws the balance in favor of death when a patient is fighting for life against the odds of wasting disease. And in nearly every community the day is one of mourning in some homes, where it has, in former years, brought death and sorrow. I know of one old lady who for four years, has observed the Fourth of July as most of us observe Memorial Day. To her it means the anniversary of the death of her husband and son, burned to death in a fire caused by firecrackers. To her it means a lonely trip to the cemetery, where she sits beside the graves of her loved ones, planting a flower or two—and always a little American flag. For although the day brought this old lady nothing but sadness, she is, above all, an American.

AUTO CORPS IN PHILADELPHIA STRIKE

A volunteer motor corps, composed of more than 30 cars, many of which were driven by their owners, was at the disposal of the Philadelphia police department night and day through the big traction strike. The corps was organized some two years ago by the Quaker City Motor Club, and its service was offered in turn to the city, the state, and the nation. When the traction strike was called recently, the police officials and the officials of the club called out the volunteer corps and a dozen or more cars immediately responded. Riots were continually breaking out in many parts of the city, and for weeks the cars and their owners were in readiness to rush squads of police to threatened points.

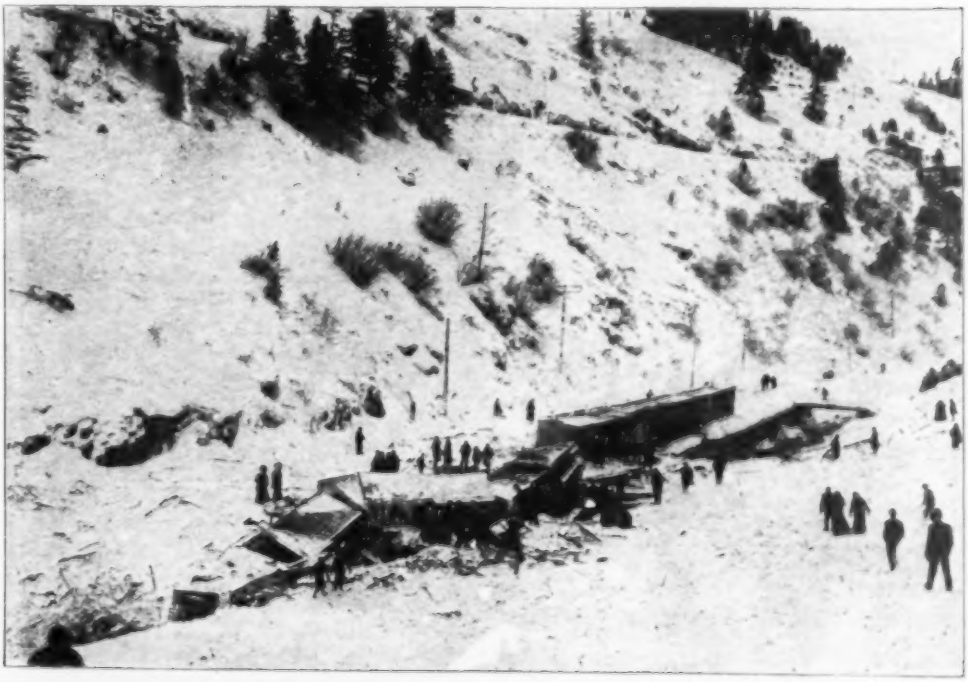
The owners of the automobiles in the corps included many well known business and professional men of Philadelphia. They usually drove the cars in person, and when compelled to rest, provided substitutes.

THE DANGER OF SNOWSLIDES

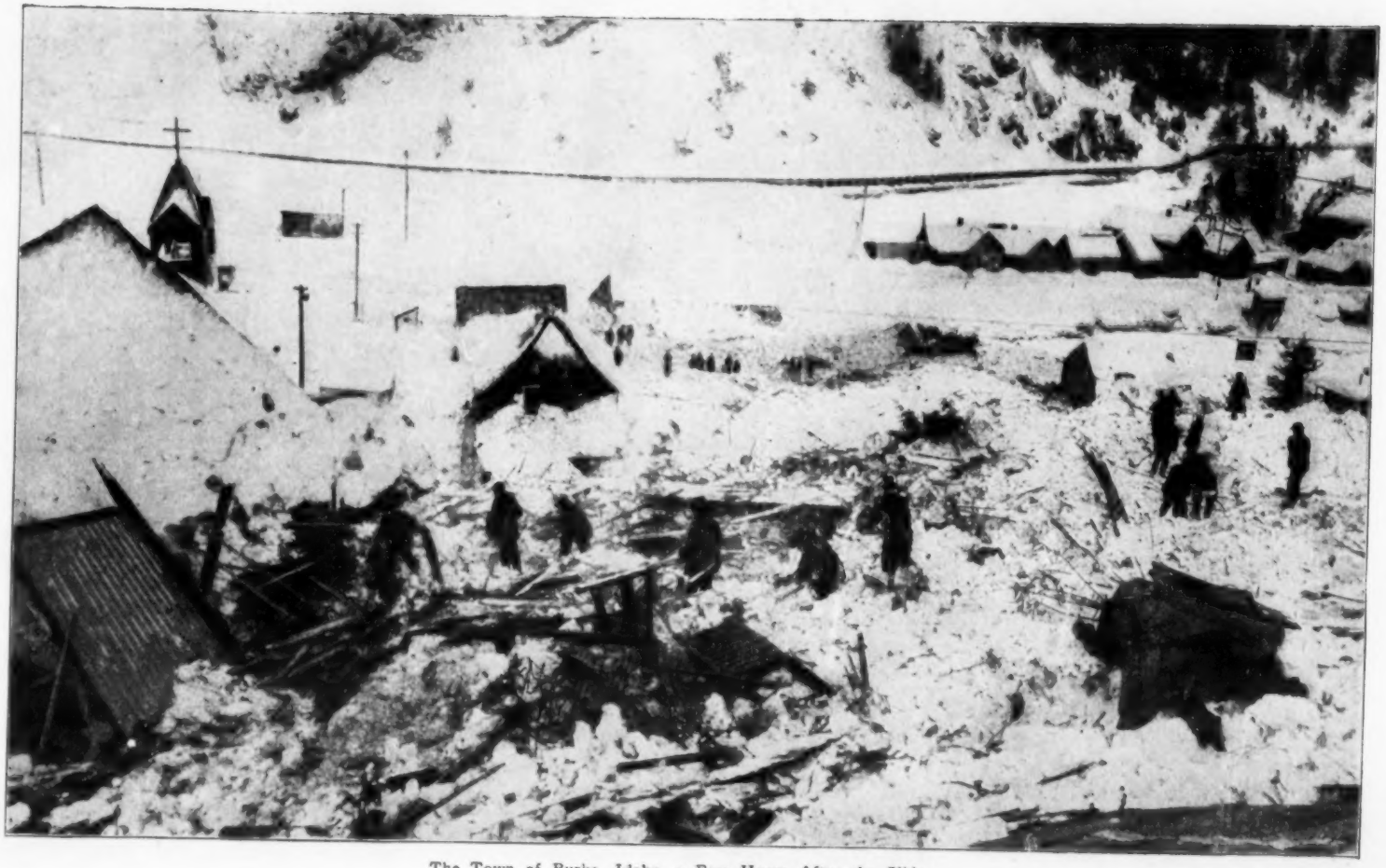
The danger of locating towns and communities at the very base of steep mountain sides, was emphasized in a startling manner during the early part of March when scores of persons were killed and great property loss was caused by snowslides. The number of destructive slides which took place was greater than ever before, and railroad officials were helpless. Trains were overwhelmed and passengers smothered and killed. Houses were thrown about like chips in the path of the advancing tons of snow.

There are two seasons of the year when snowslides are likely to occur, says Mining Science. One is the early winter and the other the early spring. Both are exceedingly dangerous. In the first, it is by the accumulation of snow on snow, which eventually falls by gravity and slides on the slippery surface of the previous snow. In the

Three Persons Were Killed in This House at Mace, Idaho—Two Escaped Alive



Great Northern Train Overwhelmed in the Cascade Mountains—Over a Score Were Killed



The Town of Burke, Idaho, a Few Hours After the Slide

Burke, Idaho, Before the Slide, Showing Its Dangerous Position Between Mountains

second case, slides are caused by the thawing of the snow induced by the warm sun of spring. This is a particularly dangerous season.

So delicately poised and balanced is the huge mass of snow that accumulates in the amphitheaters of our mountains that a very slight thing will start it, such as a deer or mountain sheep walking along, though these animals, be it said, are generally too knowing and keep on the crests and avoid the slopes. The shock of a falling slide may start any number of others in succession, like one ball striking a number of others on a billiard table. One slide in a region is sure to be accompanied by a general sliding all down the line.

When a slide descends a steep gulch from a great height, so great is the displacement of air that houses close by are thrown down like a pack of cards by the force of the wind alone without being touched by the snow. So tremendous is the impetus of the rush that the slide descending from one mountain may rush high up on the opposite one, destroying everything in reach. Buildings and even small mining camps have been so swept away, built at a height deemed safe above the possibility of any such catastrophe.

¶Prof. Elie Metchnikoff, of the Pasteur Institute, announced to the French Academy of Sciences on March 21 that he had succeeded in producing an effective anti-typhoid vaccine.

¶A tree saved M. Crochow, an aviator operating a Voison biplane, when he fell a distance of 400 ft. during the contest at Mourmelon, France, in March. He climbed out of the tree badly frightened, but unhurt.

¶One life lost for every 1,440,000 passengers carried is the record on steam passenger vessels for 1908, according to the annual report of the U. S. steamboat inspection service which has just been made public.

TOBOGGANING IN A CANOE

That a canoe provides as excellent sport on a snow-covered hill in the winter as it does on the surface of a lake or river in the summer was well demonstrated during the closing weeks of the winter by the boys of a boarding school at Asheville, North Carolina.

The speed attained on the hill, which was not an exceptionally steep one, was often as high as 30 miles an hour with three boys in the canoe. At least two boys had to ride each trip; otherwise the canoe would be top-heavy and tip over. The start down was made by the boy at the stern, and after the canoe was well under way he took his position as pilot. By swinging his weight to one side or the other, thereby making a resistance on that side, he was able to guide it down the incline. Any canoe can be used as a toboggan in this way, and after it has been run over the snow four or five times will be very speedy.

Coasting in a Canoe

¶A committee of engineers has reported that the Leaning Tower of Pisa needs strengthening to insure its safety. A spring exists under the tower.

OLDFIELD'S BENZ AUTOMOBILE GOES YET FASTER

On March 16 Barney Oldfield added to his racing laurels by driving his Benz car a mile in 27.33 seconds, a rate of 131.75 miles an hour, breaking all records for speed. This feat is recorded on page 623 of this issue, accompanied by an illustration of the wonderful auto.

Yet, a week later, March 23, he covered a kilometer (3,280 ft., 10 in.) on the Daytona, Fla., course, in 17.04 seconds, which is at the rate of 132.04 miles an hour.

The same day he traveled two miles in 55.8 seconds, a rate of 128.88 miles an hour, establishing a new record for that distance.

The Benz is a German machine, and it was with it that Hemery made the record of 126.1 miles an hour on the Brooklands track in England. The car has a 4-cylinder motor, with a bore of 7.2835 in. and a stroke of 7.8741 in. The overhead valves are located on opposite sides; and there is only one camshaft, which is on the right side. Two magnetos are used with a complete ignition system for each. The wheels are 32 by 4 in. in front and 34 by 5 in. in the rear. The wheelbase is 108 in.

EDITORIAL

The Iowa railroad disaster in which nearly fifty persons were killed under circumstances unusually horrifying—for there are degrees of horror even in the manner of accidental death—is an event which should immediately be made impossible of repetition. Before a great while a law will prohibit the making up of a train as this one was assembled. Two locomotives ahead, representing probably nearly two hundred tons of metal; the usual mail and baggage cars and lightly constructed day coaches next; then a long string of heavy Pullman cars, weighing some three hundred tons or more. Sleeping cars are purposely built heavy, with massive iron girders under the floor running the full length of the car.

When the track spread and the locomotives left the rails and came to a sudden stop, an iron wall resulted, between which and the tremendous force of the oncoming sleeping cars the day coaches were crushed like an egg shell in the hand of a strong man. It is little less than criminal to assemble a train in this manner, for any man who has railroaded a few years knows what the inevitable result must be in event of collision or derailment of the locomotives. Other trains, identically dangerous to their occupants, are being made up every day under the same arrangement. That accidents of this character are no more frequent is no reason why the lives of the traveling public should be placed in jeopardy. Not one person in ten thousand is sufficiently familiar with car construction to judge the danger or safety of a railroad car. It is up to the railroads to furnish every reasonable precaution. In this case it was not done.

It is such events as these which ultimately bring upon the railroads legislation which their managers term "adverse," and which may sometimes be even extreme. But they have only themselves to blame in many cases.

* * *

"There is no such thing as an absolutely fireproof building." These words are from an editorial in the Fireman's Herald, which also adds, "Promised security from fire cannot be guaranteed." This assertion will come as a surprise and disappointment to the general public which has come to regard certain modern structures as perfectly safe so far as danger from fire is concerned. The article from which the quotation is made was suggested by the burning out of several floors and the serious damage to others in the recent fire in a large apartment house in New York City, acknowledged to be one of the latest and best types. It is true the exterior of the building did not present a decidedly wrecked appearance after the conflagration.

The expectation that a fire would be confined to the room in which it started, or to that floor, at most, proved a mistake. Apartments contain, and are usually overcrowded with, furniture and articles of an extremely inflammable nature When once these commenced to blaze, the heat was so intense as to extend through the floor above and cause another fire there, and so on to the top. The control and subjugation of a fire in any large building chiefly depends upon the carrying out of the architect's plan to confine the fire. This contemplates the closing of all doors and windows; but when occupants are making a hurried exit, many of them fail to observe the rule.

As long as our rooms continue to be filled with inflammable articles just so long will our fireproof apartments be little more than slow burning, although that condition is a decided step in advance, and ordinarily would enable the escape of its occupants.

* * *

The plan to advance the present Bureau of Health into a Department of Health, with its secretary as a member of the Cabinet, is regarded favorably by the medical profession, and largely so by other professional and business men. With the constant enormous increase in freight shipment from one part of the country to every other part, and the travel by people of one state to others, to say nothing of imports and the influx from every other nation, there have resulted new conditions requiring more thorough control. The state boards of health are necessary, useful, and have accomplished great good; yet there will always be the temptation for any state to minimize the importance of any pest or scourge which may afflict it, from reasons of business policy or on account of local pride.

With less than ten days' travel between Europe and San Francisco, during which the passen-

ger would cross ten or more states, and with bubonic plague and other Oriental horrors already knocking at our doors, it behooves us to provide an organization whose scope and authority is commensurate. A Department of Health is not a question of politics, and is of equal importance to every citizen. We can all subscribe to the declaration of Senator Owen, who in introducing a bill for the new department said: "I believe in conservation, and most of all in the conservation of human life."

* * *

The times are indeed hard and money slow when London is not speculating in some commodity. Just now a rubber craze is in full blast, and new rubber companies, lands and plantation schemes are being capitalized and floated daily. The supply of stocks and bonds will continue as long as an easy public will assimilate the stuff. Fortunes have been made by those early in the market who have unloaded and retired. When the end comes a lot of small investors will be left high and dry.

The present high price of rubber is due to natural and legitimate causes, the chief of which is the great consumption for motor car tires. The raising of rubber presents no unusual difficulties, and while its production is confined to tropical zones, yet there are millions upon millions of acres of suitable land. Like bananas, a very fair quality grows wild in its native forests. Rubber land is not expensive, and the cost of planting and bringing the trees to a bearing state is not large. The work requires no great skill and is done by natives at wages which would seem very low here. The one thing which cannot be economized is the time which Nature demands to grow the tree, for eight to ten years must elapse before the tree is ready to "bleed." The trees will average one pound each from the first year's tapping.

In the meantime automobiles increase at a prodigious rate, and heavier cars, faster driving and greater yearly mileage combine to maintain a demand sufficiently in excess of supply to keep the price of rubber at over one dollar per pound.

No one district or country possesses all the rubber lands; on the contrary it can be raised in nearly all tropical parts of the world. South America or Africa is capable of supplying rubber in unlimited quantities at twenty-five cents a pound or less; in fact, tons were bought the past year in Liberia at an average price of fifteen cents a pound, which sold in Europe at eighty-five cents.

It is simply a question of supply which will be for some time less than the demand; then as the new plantations come into bearing, supply and demand will gradually equalize, and eventually will draw together, and then rubber raising will be on a par with the raising of corn or wheat or other staples.

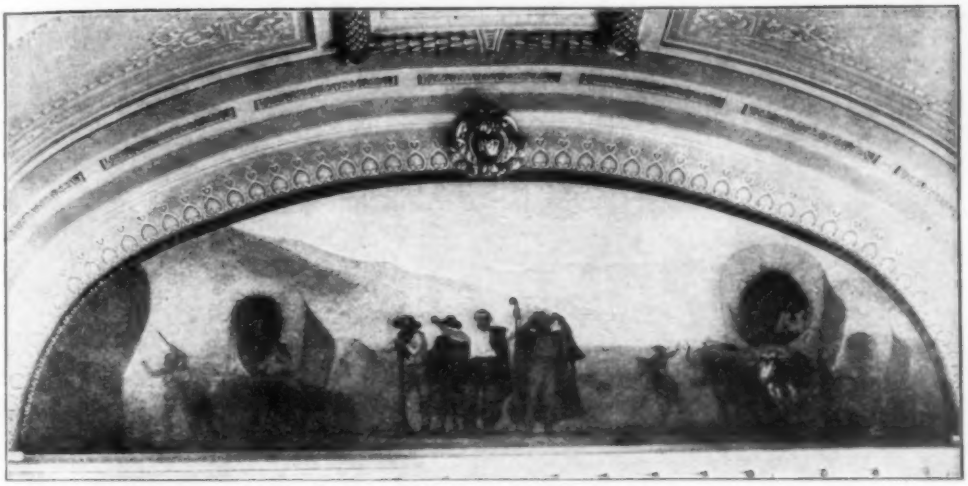
* * *

In the State of Nebraska the educational forces have a logical, harmonious and practical plan of co-operation which might be copied elsewhere to advantage. The arrangement is not the result of any law, and is in no way compulsory, yet it is in good working order throughout the State and has been highly successful.

In the rural districts the scholars are urged to accompany their teacher once each year to spend a day visiting the nearest high school, in order that they may gain a better knowledge of the opportunities offered them when they complete the work of the rural school.

For the same reason, once each year the members of the senior class in the high schools are encouraged to make a trip to the State University, in order to obtain a better idea of what is in store for them on graduation from the high school. On these trips, which are participated in by both the boys and girls, an instructor accompanies them. On arrival at the University, the student is at liberty to visit whichever branch of work he fancies—classical, scientific, engineering, agricultural or normal, either on his own account or under the guidance of a resident professor or student. The actual demonstration of the facilities afforded and the value of more advanced study are thus brought home to the young person as could be done in no other way, and the result is that hundreds of young Nebraskans are today working in its University who otherwise would have completed their school work on graduation from the high school. Even for those who do not go on, the personal knowledge of the school system beyond the part they have been able to take makes them better citizens.

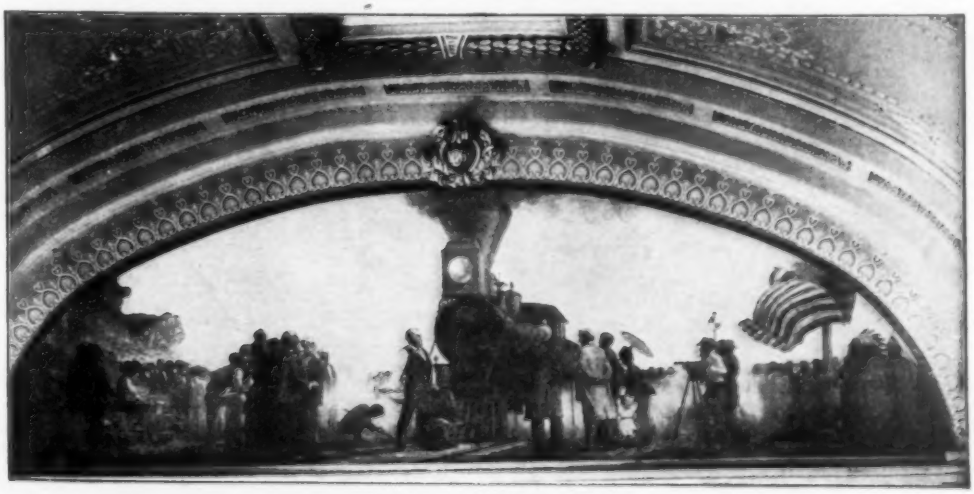
H. H. WINDSOR.



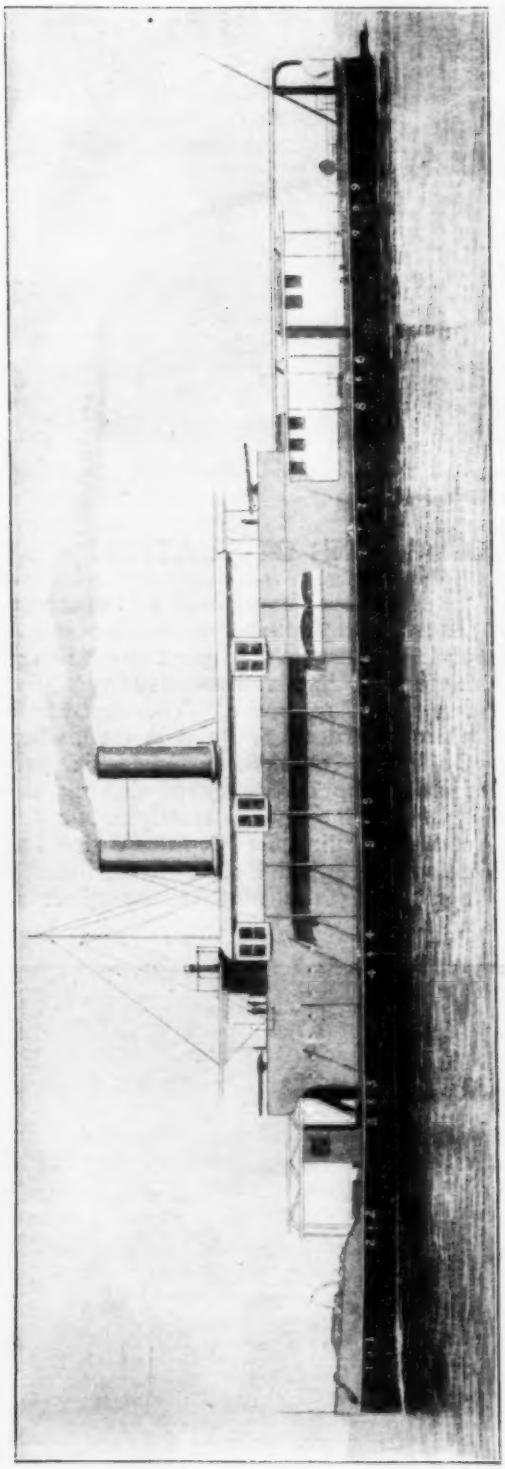
Arrival of the Mormon Pioneers

HISTORIC MURAL DECORATIONS IN STATION

The finest decorative features of the new $400,000 union passenger station in Salt Lake City, Utah, are the mural decorations in the general waiting room. In the tympanum arch panel at the south end of the room the arrival of the pioneers of 1847 at the spot now occupied by Salt Lake City, is shown. The central group of the picture is Brigham Young surrounded by three of his principal counselors. On either side, and in the distance, appear the winding caravans of ox teams and prairie schooners characteristic of pioneers. The mural decoration in the north arch depicts another great event in the history of Utah, and is called the "Driving of the Last Spike." This event took place at Promitory Point in 1860, when Governor Stanford, of California, performed the ceremony of driving the golden spike that formally made the connecting link between the Union Pacific and Central Pacific roads, thereby completing the first transcontinental railroad.



"Driving of the Last Spike"



GUNBOAT OF TEN FLOATABLE SECTIONS

A powerful little gunboat for river and shallow water service that only displaces 2½ ft. of water, can be packed away in sections, each one of which will float, and can be united when afloat, is one of the remarkable fighting vessels recently completed for the British government.

The vessel is 160 ft. long, and the hull is divided into 10 floatable sections. The joints of these are shown by the numerals along the side of the hull in the illustration. It was designed for use on the inlets and shallow rivers of Britain's more isolated possessions and dependencies. Taken across an ocean on a transport ship, the floatable sections can be dropped into the water one by one and locked together, after which operation it is ready to commence operations. Each section of the hull has water-tight bulkheads that extend above the water line.

ELECTRIC HEADLIGHTS FOR AUTOS

Tungsten automobile lamps, owing to the low voltage at which they operate, and the smaller number of cells in series thereby made possible, have extended the field of automobile lighting to such an extent that electric headlights of great brilliancy can be used. The filaments of the improved tungsten lamps for this purpose are short, and strong enough to resist the vibration and jar if properly installed. Additional precaution may be taken by adding a shock-absorber to the equipment.

One such absorber now on the market consists of a strap-iron stirrup, and a loose bushing centrally located and supported by a coil spring. The spring forms a shock-absorbing connection between the stirrup and the tungsten lamp.

Carbon filament lamps, because of their low efficiency, would require a battery of almost prohibitive size and weight, while two 20-cp, tungsten head-

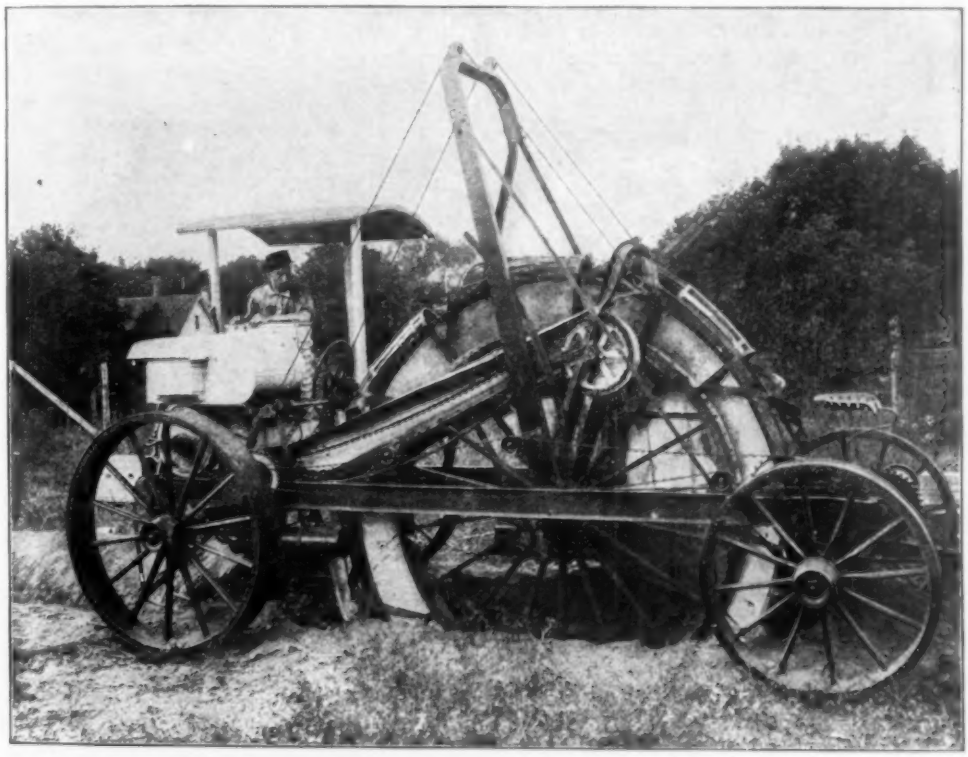
lights, one 2-cp. tail light, and two 2-cp. side lights could be supplied continuously for 12 hours without recharging, by a battery weighing only 55½ lb. This battery would replace the ignition batteries weighing probably 25 lb., and a gas tank weighing 30 lb., so that the weight would be about the same. The battery is available for engine ignition, and may be recharged on any direct current system, or from an alternating current system with a mercury rectifier.

NEW DITCH EXCAVATOR DRAWN BY CABLE

A novel excavating machine, which digs ditches from 8 in. to 4½ ft. in depth, and is drawn forward by the winding of a cable on a drum, operated by a 4-cylinder, 40-hp. gasoline engine, is the latest addition to the many machines designed for that purpose.

The entire weight of the ditcher is 3,600 lb. The cable by which it is drawn is attached to a post some distance ahead, the machine advancing as fast as the excavator opens the ground. Owing to its comparative lightness and the width of its tires, it will work on very soft ground.

The inventor claims that this machine will dig a rod of tile ditch in two minutes.



The Machine at Work—Digs a Rod of Tile Ditch in Two Minutes

CONCRETE BARGES FOR PANAMA CANAL WORK

Three concrete barges are being built in the Panama canal zone to be used for supporting the dredging pumps for the hydraulic excavating and pumping plant of the Pacific division. Each of the barges will be 64 ft. long by 24 ft. wide, and will have a depth of 5 ft. 8 in.

¶The first air-ship sales depot in Canada has been started at Victoria, B. C.

CONCRETE HOSPITAL FORMS SOLID MONOLITH

A glance at the accompanying illustration will show the new state hospital at Lima, Ohio, to be unlike that of any other institution of the kind in the United States and probably in the world, the buildings, all of which are reinforced concrete, constituting a monolith. Forms were built for the walls, ceilings, floors, and roof, and the concrete was poured in, making all one solid piece.

The whole comprises what is said to be the largest group of concrete buildings in the country, and the formation is the result of a desire to isolate the different sections and at the same time have them strung together by connecting links. Almost two years were consumed by the building commission and the architect in devising the plans. The buildings surround a rectangular court 250 by 500 ft. Each building or group of buildings radiating from this court is known as a pavilion, and each pavilion has an individual court, used by the patients for exercising and sitting in the open air.

To the rear of the hospital is the power house, which will provide power, light and heat, and water supply. Ultimately, detached cottages will surround the monolith.

All conduits for electric wires and telephones, and all pipes for heating and water supply, are built in the concrete. As far as possible, wood has been eliminated, the hinges for doors and the anchors in window jambs for steel window guards being sunk into the concrete. All the exterior walls have a brick veneer, an interesting feature in concrete construction. There is nothing in the structural parts of the mass of buildings that will disintegrate, and the whole is considered almost indestructible.

Monolithic Hospital at Lima, Ohio

MOTOR PILOT BOAT FOR SCOTCH COAST

A motor pilot boat, 32 ft. in length by 8 ft. beam, equipped with a 15-hp. engine that uses oil as fuel, has been built for the Grangemouth pilots on the Firth of Forth, on the east coast of Scotland. During winter months the weather on the Scotch coast is of the severest nature, and that the hardy Forth pilots should go in for motor-driven boats in preference to sailing craft when seaworthiness and reliability are the first qualifications, is a high tribute to the capabilities of the former.

The staunch little vessel, decked over fore and aft with the exception of a small cockpit for navigating purposes, will carry a large spread of sail in the form of an easily-handled sloop rig.

HYDROGEN FOR INFLATING AUTOMOBILE TIRES

By Dr. Alfred Gradenwitz

A STRANGE use for aluminium has been suggested by a French inventor, M. Drouilly, for the filling of pneumatic automobile tires with hydrogen generated by the decomposition of water under the action of a specially prepared compound of aluminium.

Drouilly some time ago used the hydrogen thus obtained, at the moment of its production, for the decoloration of the sugar-sap derived from beets. In similar manner, the hydrogen generated by the same process was employed by the Russian army during the war with Japan for the filling of balloons.

For the inflation of pneumatic tires the aluminium compound is used in the form of small pellets. Though these produce a less violent reaction than aluminium powder, the effect is quite sufficient, and affords the additional advantages of a slighter increase in temperature and greater ease in handling.

Drouilly makes use in this connection, of the familiar compressed-air cylinders generally used for inflating pneumatic tires, but which only too often fail to work at the critical moment. After unscrewing the bronze stopper, he introduces into each cylinder of 3 liters capacity, 300 grammes of aluminium pellets and 300 grammes of water. After replacing the stopper he then obtains 375 liters of hydrogen, which, in the free space of 2½ liters are compressed at a pressure of 150 atmospheres.

M. Drouilly Inflating Tire with Hydrogen

The residue, consisting of alumina, is readily eliminated by washing. In order to be able to dispense with any addition of potash or similar alkaline substances, Drouilly adds to the aluminium some grammes of pulverized mercury bi-chloride, which is quite sufficient to start the reaction.

It is interesting to note that the pressure can be increased, not only to 150, but even to 1,000 and more at-

mospheres, so that much caution must be used. The magnitude of the pressure obviously depends on the quantity of chemicals used, and, for the sake of safety, should not be allowed to increase beyond the strength of the ordinary steel cylinder. It is of special importance to add a sufficient amount of water, so as to avoid any vaporization due to the increase of temperature, which, by adding the tension of the water vapor to the gas tension, would result in an explosion.

This unique process allows the steel cylinders, which, after their compressed air has been used, at the present time only constitute dead weight, to be utilized in a practical manner. Furthermore, the use of hydrogen for inflation affords the special advantage that this gas does not issue so readily through the India-rubber walls of the tire.

Inflating a pneumatic tire by this novel process involves a cost of only about 3 to 4 cents.

LOS ANGELES' BOARD AUTO TRACK

The new automobile racing track at Los Angeles, Cal., forms a circle 5,281 ft. in circumference, and has a surface composed of 2 by 4-in. lumber laid on edge and running lengthwise. This type of track, the first of its kind in the world, will provide an absolutely hard speedway for the racing cars, and do away with the danger always present on ordinary speedways when the roadbed becomes torn up by the speeding cars. The wooden track, it is expected, will be as fast at the end of a long race as at the beginning.

Diagram of Los Angeles Board Track

Being perfectly circular, the inward slant of the track is the same all the way around, the outer edge being 14 ft. 6 in. high. The width of the track is 45 ft., and just inside of it is a dirt track 30 ft. wide. The track will be

lighted for night racing by 70 arc lamps of 4,000 cp. each. The grandstands are elevated 4 ft. above the track, and 4 ft. away, the intervening space providing a promenade for the spectators.

Battery of Sprinklers in Vegetable Field

PROVIDING ARTIFICIAL RAIN

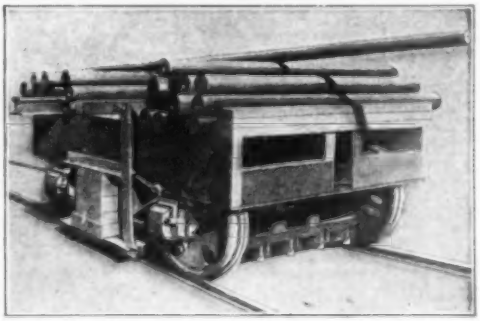
Many of the vegetable growers of southern Florida have solved the dry-weather problem by piping their fields in such manner that sprinklers on 6-ft. standards provide a veritable rain shower as often as the pumps are started. The main feed pipe runs along the edge of the field, and, at distances of about 20 or 30 ft. apart, laterals are run across to the other side. The sprinkler standards are about 30 ft. apart and rise from every part of the field, so that, when all are in operation, the water falls over the entire surface like rain.

The pump, housed in a small building on the property, is usually driven by a gasoline engine.

NOVEL TRUCK FOR RIPPING UP MACADAM

The management of a California street car line, exasperated with the slowness and high cost of the old pick and shovel method of tearing up macadam pavement, called on its mechanical department to devise a better way.

The "digger" shown in the accompanying illustration was the result of several days of experiment. It consists of a heavy set of trucks on which there was mounted a rigid angle-iron frame. Ten blades or knives, like the one shown at the side of the car, were made from tool steel with points hardened. These were placed in cast housings and backed up with heavy timbers, five pointing one way and five the other. The knives are held by adjusting plates, the first hole placing the blade in position for tearing up 2 in. of macadam, the second for 4 in., and the third carrying the point to the ties. Weighted with six tons of axles, and pushed by a motor car, the rig will break up 800 ft. of macadam an hour, an amount of work that it would take 25 men a week to accomplish by the pick and shovel process.



Tears Up Macadam in Quick Time

A MOTORBOAT NAVAL RESERVE

The Seattle Yacht Club is forming a motorboat naval reserve as the nucleus of a volunteer naval organization for service, and naval officers have been assigned to confer with the officers of the club and assist them in any way possible. Official recognition of the fleet is hoped for from the naval department.

Exterior of Portable Bath House

the state of Washington. On the roster of the club are enrolled about 60 cruising motorboats and auxiliaries. The men who own and handle these take great pride in their knowledge of navigation, and many of them maintain a discipline during cruises as rigid in some respects as on a warship. The result is that within the club's membership can be found many young men who are admirably adapted to act as pilots, or navigators in Puget sound and its adjacent waters.

The naval department has realized the value of such an adjunct to its

BALTIMORE'S PORTABLE SHOWER BATHS

The city of Baltimore has a fine system of portable shower baths in which the residents of the congested sections may enjoy both hot and cold water baths during the summer months. Although called portable, the baths are not like the Kansas City type, described in a recent issue of Popular Mechanics, which are moved from place to place every few hours, but are baths housed under canvas, or constructed of galvanized iron sheeting. They are erected

on vacant lots in congested districts and remain at one place all summer, the "portable" meaning that they can then be taken down and packed away until required the next year.

The galvanized iron portable baths, the exterior of one of which is shown in the illustration, are supplied with both hot and cold water, the hot water being obtained from a small coal stove with a water jacket and 50-gal. tank, all placed in a small house adjoining the main building. The main building itself, as the illustration shows, is not at all pretentious, but the interior is divided into seven compartments, each of which is subdivided so that each bather has a small room in which to dress and undress, and a second compartment in which to take a bath. The interior of the building, mostly of wood, is shown partly assembled in the other illustration.

The patronage of such a bath on warm days numbers about 400. On two days a week women attendants are placed in charge, and the baths are turned over to women and girls. From 350 to 400 availed themselves of this opportunity. During the summer months of last year more than 16,132 persons used the bath shown in the illustrations, and the other baths were almost as well patronized.

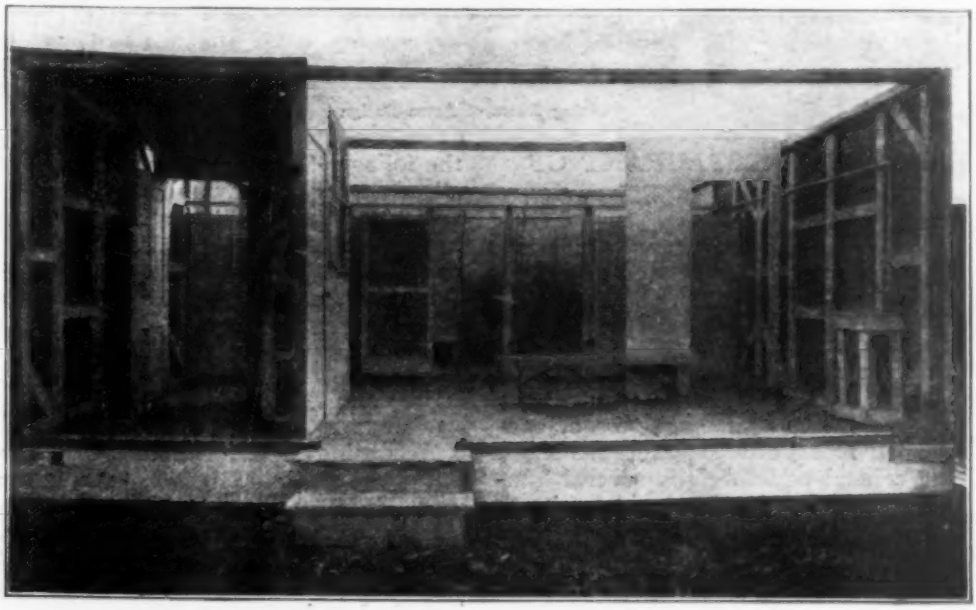
NEW PIANO AND DESK ELECTRIC LAMPS

The special lighting requirements for pianos and desks have resulted in

FIG.1 FIG.2

Artistic Desk and Piano Fixtures

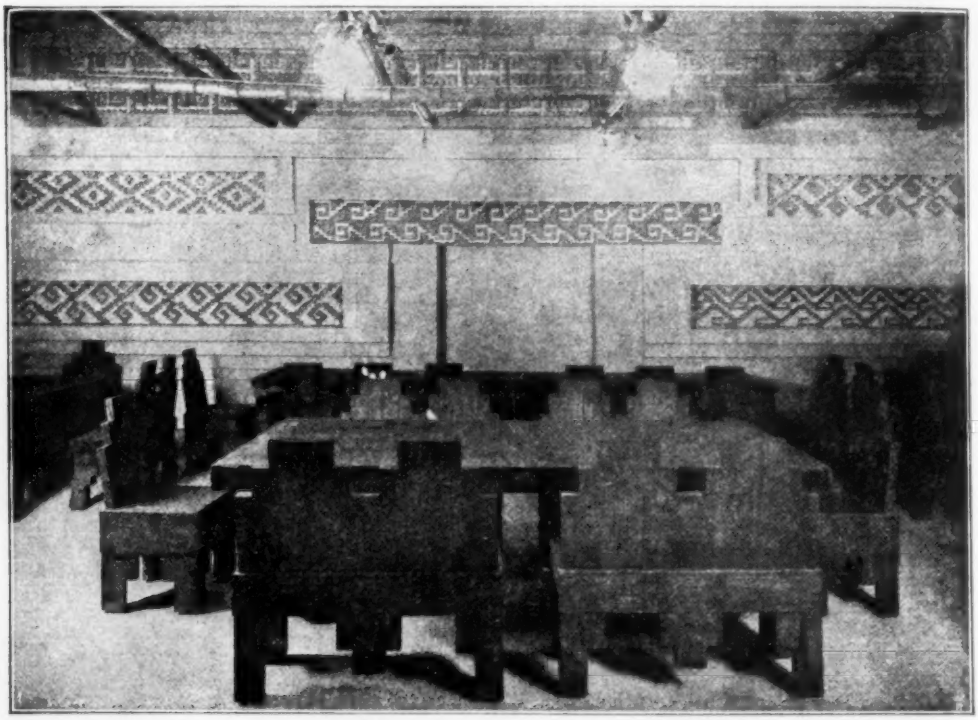
the two types of electric lighting fixtures shown in the illustrations. The piano fixture has a heavy brass standard from which an arm, carrying the shade and bulb, extends horizontally. The shades are made of green glass,



Interior of Portable Bath House, Partially Assembled

having an opal interior reflecting surface. The desk fixture has a handsome upright brass standard, the base of which contains two ink wells. Just above the base is a brass rack for holding pens. A clamped arm type is also made for roll-top desks.

The room is a reproduction of the inner part of an ancient Aztec temple, which was built open to the sky. To produce this effect there is a ceiling of blue gauze and a trellis of large bamboo rods from which hang tropical vines. The electric lights are mingled with the foliage. The linen for the tables is all of Mexican drawn-work design of ancient pattern. The walls, which are over 14 ft. high, are of stucco in Aztec design, and the general background is dark gray, ornamented with fret-work of dull red. The floor is a composition of imitation tiling.



Dining Room of Aztec Design

MUSEUM RESTAURANT OF AZTEC DESIGN

The new restaurant of the American Museum of Natural History, situated in the basement of the east wing of the structure, is of great interest because of its Aztec decorative treatment. The main dining-room, or patio, is 25 ft. long by 25 ft. wide, and within it are massive tables of tropical wood, constructed along crude, ponderous lines. The central table weighs several hundred pounds, and on each side of it are two huge benches with seats a foot thick, and castellated backs. Single bench seats are placed at the ends of the table.

SHIPBUILDING IN 1909

According to Lloyd's, the total output of the shipbuilding industries of the world in 1909 was 1,602,057 tons, exclusive of warships. Of this figure, 991,066 tons, 526 vessels, are credited to Great Britain. The warships launched at both the private and gov-

ernment yards of Great Britain numbered 42, or 126,230 tons, while the total world output of war vessels was 109, or 278,245 tons.

The number of vessels built in other countries than Great Britain in 1909 totals 735,610,991 tons. Of this tonnage displacement, the United States is credited with 209,604 tons. That the most important part of this will be found on the Great Lakes is shown by the fact that there was only one merchant ship of over 5,000 tons launched for ocean trade, while the figures for the Great Lakes include 15 steamships of more than 5,000 tons. The United States, due to the shipbuilding industries of the Great Lakes, is given second place in shipbuilding. Germany follows with 128,696 tons.

England is the only country showing an advance over the 1908 output, the United States falling short of the 1908 record by 31 per cent, Germany nearly 40 per cent, and France 49 per cent.

THE NEWEST TYPE OF SIGNBOARD

English automobile publications are greatly favoring the adoption of this novel type of signboard, believing it far superior to the ordinary arrangement. The arms and hands point the direction, and above and below them in large metal letters and figures are the names of the nearest communities and

Signboard Easily Read in Dark

the distances. The letters and figures have no background but the sky, and, outlined against it, can be read almost as well by night as by day.

GALVANIZED WIRE FOR PERSONAL ADORNMENT

Ornaments of galvanized wire are considered more valuable than precious

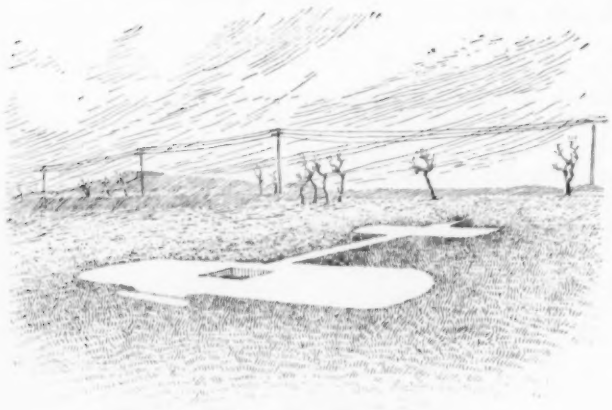
Adorned with Galvanized Wire

gems by the tribes of East Africa, and the native woman who owns the largest number of wire rings for neck, wrists, and ankles, considers herself the belle of the community. The illustration shows three Masai women so adorned. One of them has nearly a dozen rings about her neck.

ENGINE CREWS DISLIKE FRONT-END CABS

Fear of the consequences in case of collision has made the new front-end cabs of the Southern Pacific railroad very unpopular with firemen and engineers. In spite of the fact that the road pays double schedule wages for service on them, some of the crews have threatened to quit rather than take the jobs. In some instances men have left the division on which the new engines are used to avoid the runs.

STONE MEMORIAL MARKS BLERIOT'S LANDING



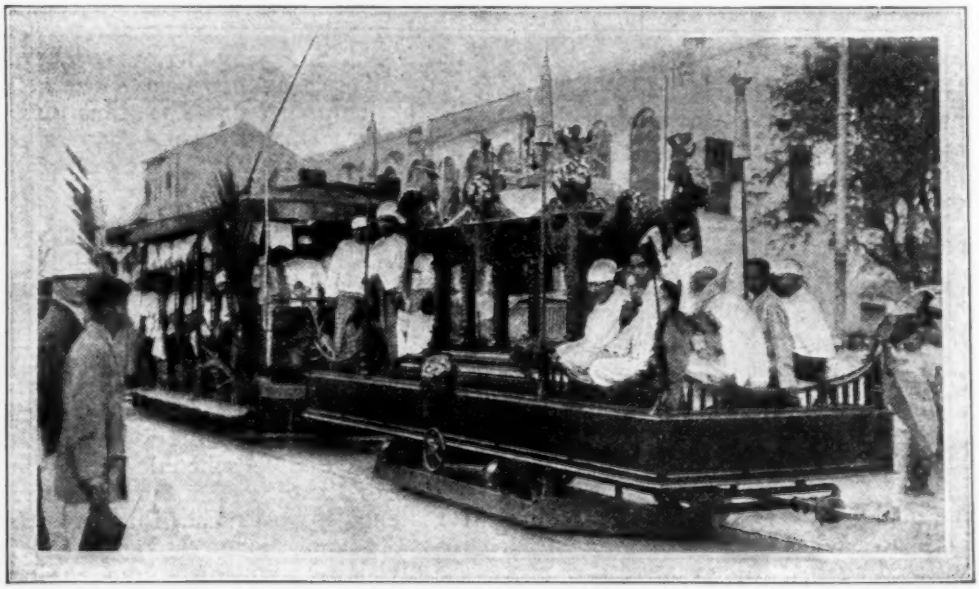
Where Bleriot Landed at Dover

A stone memorial, of the exact size and general outline of the aeroplane Blériot used in his famous flight across the English channel has been sunk into the ground at the spot in the meadow at Dover, England, where he landed. The curious stone shape, which looks more like the shadow cast by Blériot's monoplane than like the monoplane itself, was presented to the British Aero Club by A. Duckham.

ELECTRIC FUNERAL TRAIN IN BURMA

The first funeral conducted on the electric street railway of Rangoon, Burma, India, is shown in this illustration. The chief mourners and pall bearers ride on the car containing the coffin, and the others are loaded into a trailer.

Burmese burial ceremonies are weird affairs when compared with European and American funerals. Accompanying the cortége are usually a few musicians, who play Burmese music on reed instruments that make a noise almost as piercing as Scotch bagpipes. The mourners laugh, smoke, and enjoy the event as if it were some joyous occasion, instead of separation from some loved one.

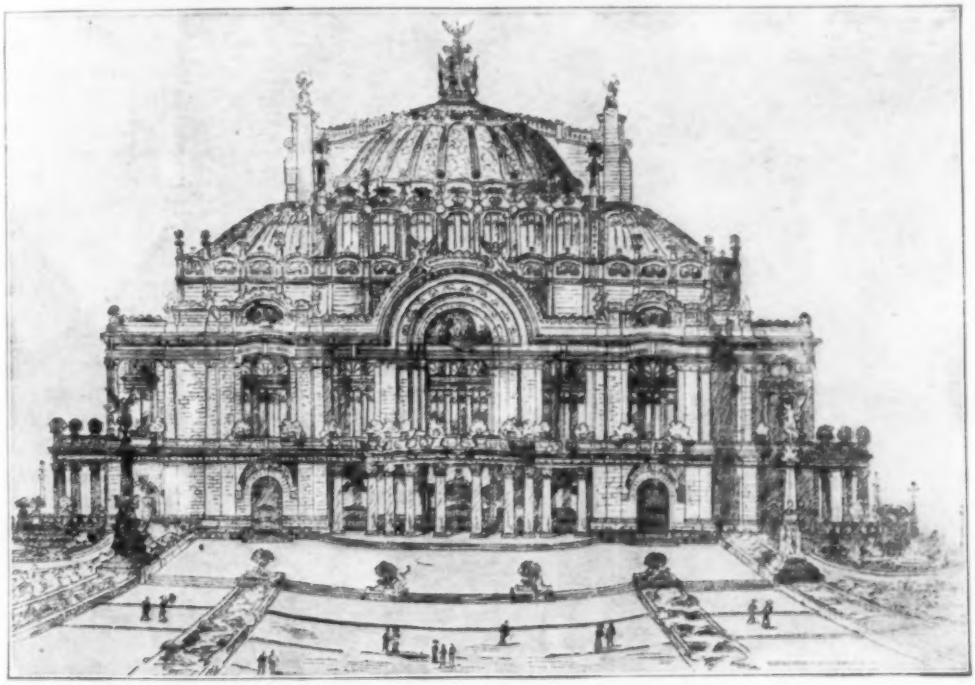


Street-Car Funeral in Rangoon

EARLY DAGUERREOTYPE ... was found in Californi...

MEXICO'S NATIONAL THEATER

The Mexican government is erecting in the City of Mexico a national theater that will be one of the most magnificent in the world. The wonderful structure, an idea of whose architectural beauty is gained from the illustration, is nearly completed. The cost will be about $6,000,000. The interior finish is of Italian and Mexican marble, and the framework is of steel construction. The government is not only erecting the building at its own expense, but will liberally subsidize the performances given there.



Mexican Theater as It Will Look When Completed

Owing to the fact that the City of Mexico is subjected to periodical earthquake shocks special care was taken in the construction of the foundations. Since the work of construction was started several severe shocks have been experienced but they are said to have made absolutely no impression on the building. Several of the South American republics also have fine national theaters.

STEEL WATER-GATES FOR CAR FERRIES

Steel water gates are to be installed at the sterns of several of the huge car ferries of the Great Lakes as a safeguard against their being sunk by big seas that might rush aboard. Nearly all the car ferries on the lakes are open above the main deck at the stern for the passage of cars. Experts believe that a big sea rushing aboard the "M. & B. No. 2" on Lake Erie in December, 1909, was the cause of her foundering. The gates, it is believed, will form a movable bulkhead at the stern that will effectually keep out the heaviest sea.

¶The use of an electric fan for controlling the draft is being advocated by some engineers, for the successful burning of bituminous coal in house heaters.

¶Of the 282 steamships which carried steerage passengers across the Atlantic during the first half of 1909, 143 were equipped with wireless instruments.

EARLY DAGUERREOTYPE WITHSTANDS 57 YEARS OF EXPOSURE

Attached to the slab which marks the resting place of the woman whose features it represents, the first daguerreotype made west of the Alleghanies has withstood the destructive effect of the weather for over half a century. And in spite of the exposure the face is discernible and the metal on which it was reproduced has corroded but little. It is located in a little churchyard at Brookville, Ind.

Picture on Tombstone 57 Years

O. F. Fitch, who is still living, made the daguerreotype. He was the second successful follower of Louis Daguerre, who announced his discovery in 1839. Fitch made the old photograph later placed on the tombstone in 1842 under great difficulties. He had to build his own camera and his supply of chemicals was secured from the limited stock of a backwoods drug store.

The 14-year-old daughter of the pastor of Brookville was the first person to have her picture taken. A short time later Fitch married her, but when gold was found in California he set out for the west alone. The ship on which he was making the trip was wrecked at the Sandwich Islands, and he was the only survivor. Two years later he was taken off by a homeward-bound vessel, and reached Brookville in 1853, to find that his wife had been buried a week before. He erected a slab over her grave, and placed her daguerreotype portrait within a niche where it still remains.

In taking the picture, a polished plate of copper was silvered, and highly finished. It was then exposed, alternately, to the vapors of iodine and bromine, then placed in the camera. The focus had been previously determined, and the long exposure, a slow process, followed. The plate was then vaporized with mercury, washed with hypo, fixed with the same salt and with chloride of gold, and the resultant amalgam was baked over a flame to drive off the mercury. The picture was thus left in a film of pure gold.

ONE MAN IS BUILDING RAILROAD

There have been several notable instances in which the capital of one man has built a railroad, but this is the first time on record that one man has set out not only to furnish the capital for a railroad, but to actually do the work of building it alone.

The road is expected by the builder to extend the 54 miles between Jetmore and Garden City, Kansas, and its owner is Rudolph Meyers, who is shown with the team of mules in the illustration. This combination of two mules and one man has toiled on the line for 18 months, and in that time accomplished only two miles of grading. But the two miles is through the roughest part of the country. Some of the ridges that Meyers had to level were as high as 50 ft., and the ravines that had to be filled were deep.

This man, the strangest railroad pioneer of the west, has not as yet sought to interest capitalists, nor uttered a

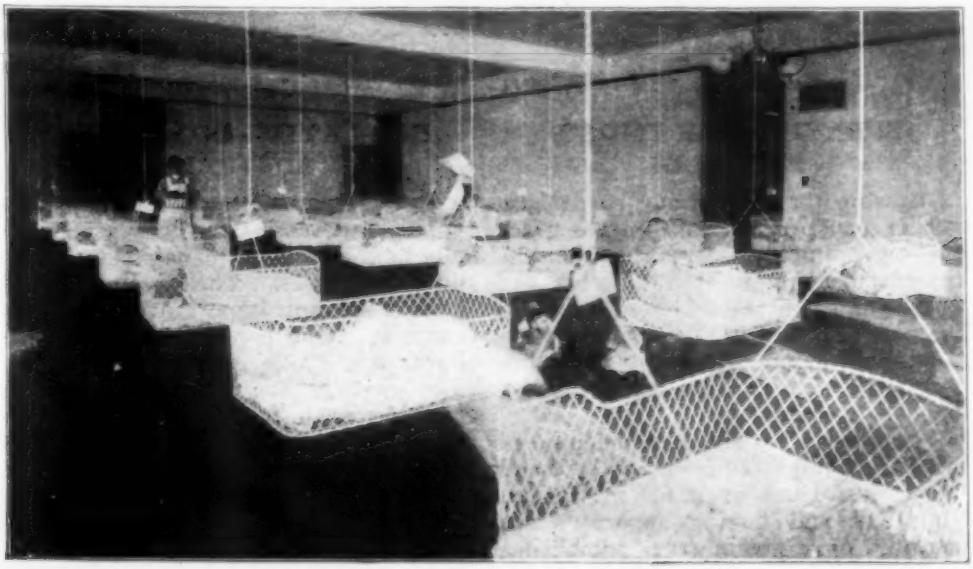
Unique Railroad Builder of Kansas, His Co-Laborers, and Stretch of Grade

word about bond issues. It is said that he has not even taken anyone into his confidence.

SUSPENDED CRADLES IN CHILDREN'S HOME

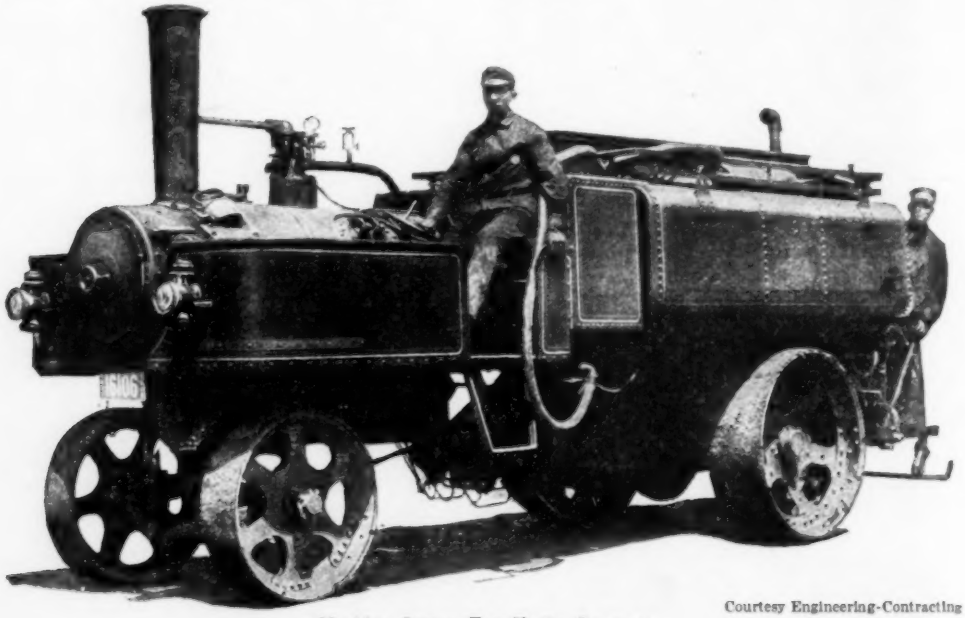
The cradles or beds of the nursery of the House of Providence, Detroit, Mich., are hung from the ceiling by stout rods. Many factors were considered in evolving such a unique and ingenious arrangement, and the result is a substitute for ordinary cribs that is both sanitary and convenient. The cradles are nothing more than heavy wire baskets with strong iron frames.

The arrangement requires considera-



Nursery Provided with Hanging Cradles

bly less than half the space that would be occupied by beds, while the floor beneath is left clear as a playground for the older babies. The work of the nurses is materially lightened, as they do not have to stoop to care for their charges while in the cribs, there are no covered spaces on the floor for the collection of dust, and the slightest movement of the occupant of a cradle causes it to sway in a manner calculated to soothe a restless infant.



Courtesy Engineering-Contracting

Machine Sprays Tar Under Pressure

SPRAYING TAR UNDER PRESSURE

In using tar for treating roads both during construction and as a surface coat on completed roads, it has been the custom to apply it by hand-work and by machine, but lately most attention has been directed towards the development of machines which spray the prepared tar under high pressure, giving a smooth, even coat.

The illustration shows a machine of this nature imported from Scotland and in successful use on roads in Boston. The tank and tarring apparatus are mounted on a steam truck which has broad, flat wheels that cause no injury to macadam roads. Tar pumps take the tarvia from the 1,000-gal. tank, and force it into an intermediate cylinder against an air pressure of about 120 lb. The tarvia is then led into four spraying nozzles, which are inclined forward about 9 in. from the ground at the back of the machine. The steam engine furnishes both the locomotive and the spraying force, and the machine has a speed of about 3 miles per hour while spraying.

EGG-LAYING CONTESTS IN AUSTRALIA

Egg-laying contests are becoming popular in Australia. They are generally held under the management of the different states. The feeding of the hens is the most important factor in the contests. One pen of six white Leghorns laid 826 eggs in seven months. The experts are continually experimenting with foods to determine on what diet the hen will be most productive. Bone-forming materials are fed to them, and the winner of one contest fed his fowl with curds of skimmed milk, obtained by using rennet, with most satisfactory results.

HOW TO MAKE A HALL CLOCK

The hall clock shown in the illustration should be made of plain oak. The following pieces will be needed to make it:

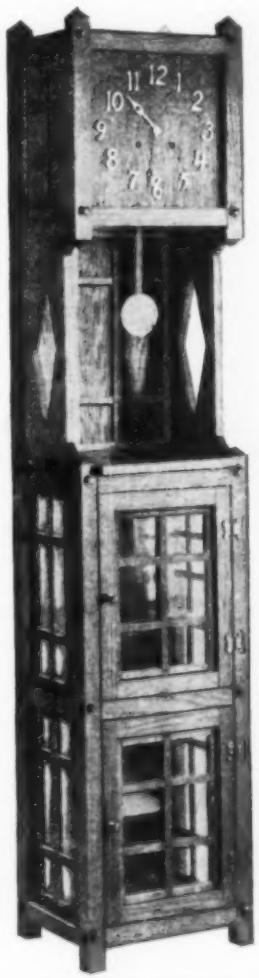
2 Back posts, 1½ by 1½ by 81 in., S-4-S
2 Front posts, 1½ by 1½ by 21 in., S-4-S
2 Front posts, 1½ by 1½ by 44 in., S-4-S
10 Front and back horizontals, 1½ by 1½ by 15 in., S-4-S
10 Side horizontals, 1½ by 1½ by 11 in., S-4-S
1 Face, ⅜ by 14 by 14 in., S-4-S
Front doors—
4 Rails, ¾ by 1½ by 18 in., S-4-S
4 Stiles, ¾ by 1½ by 12 in., S-4-S
4 Horizontal mullions, 3/16 by ¾ by 11 in., S-4-S
4 Horizontal mullions, 3/16 by ⅝ by 11 in., S-4-S
4 Vertical mullions, 3/16 by ¾ by 15 in., S-4-S
2 Vertical mullions, 3/16 by ⅝ by 15 in., S-4-S
Back—
1 Piece, ¾ by 14 by 21 in., S-4-S
2 Pieces, ⅜ by 14 by 18 in., S-4-S
4 Horizontal mullions, 3/16 by ⅝ by 14 in., S-4-S
4 Vertical mullions, 3/16 by ⅝ by 20 in., S-4-S
Top side panels—
2 Pieces, ⅜ by 9½ by 14 in., S-4-S
8 Horizontal mullions, 3/16 by ⅝ by 9½ in., S-4-S
6 Vertical mullions, 3/16 by ⅝ by 14 in., S-4-S
2 Middle side panels, ¾ by 9½ by 20 in., S-2-S
Lower side panels—
8 Vertical mullions, 3/16 by ¾ by 18 in., S-4-S
8 Vertical mullions, 3/16 by ⅝ by 18 in., S-4-S
8 Horizontal mullions, 3/16 by ¾ by 9½ in., S-4-S
8 Horizontal mullions, 3/16 by ⅝ by 9½ in., S-4-S

If the worker will take the trouble to combine the different lengths of pieces having like thicknesses and widths into pieces of standard lengths, he will be able to save himself some expense at the mill with no more work for himself.

Begin work by shaping the ends of the posts as indicated in the drawing. Lay out and cut the mortises for the tenons of the horizontals or rails. These mortises need not be deep if the joints are to be reinforced later with lag screws as is the clock shown. They may be what are known as stub tenons and mortises. The tenons are not more than ½ in. long, just enough to keep the rail from turning about.

Next lay out and cut the tenons on the rails. Bore the holes for the lag screws, being careful to bore on adjacent surfaces so that the holes will miss each other. Use a ⅜ by 3-in. lag screw, boring the hole in the tenon with a ¼-in. bit the full depth the screw is to enter.

The side panels should be fitted into grooves in the rails, so before the frame is put together these panels should be squared up and the grooves cut in the rails and posts at the proper places.

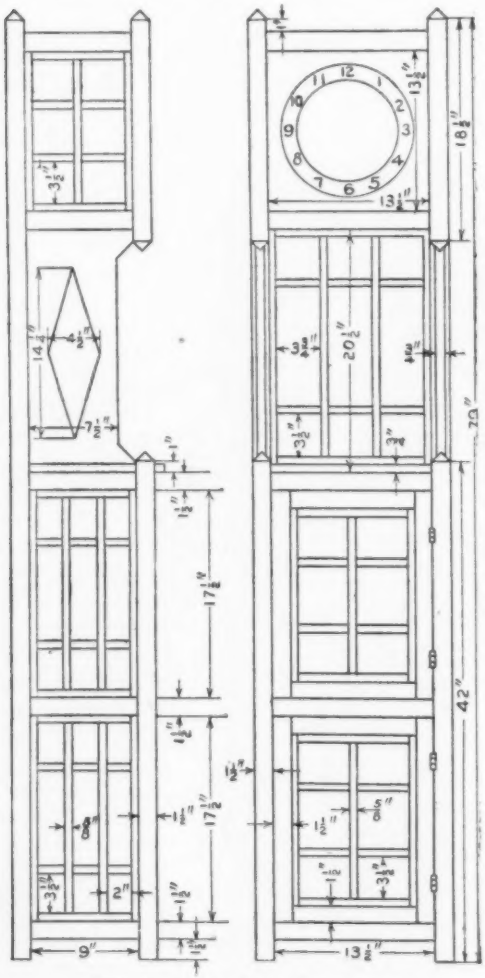


Hall Clock Complete

The mullions of the lower side panels, it will be noted, are specified ⅝ and ¾ in. wide. The ⅝-in. pieces are for the central parts of the frame and the others for the outside. The frame is to be made ⅛ in. larger all around than the distance between the posts and between the rails so that it may be set in grooves cut in the posts and the rails to a similar depth, ⅛ in. This is true, also, of the mullions of the front doors. Square up the shelves so that they may be set into grooves in the adjacent rails. The

middle shelf is to have an overhang and will rest upon the rails.

The mullions of the top side panels are all of the same width, and it is not intended nor necessary to set their frame into grooves in the posts. The



Details of Hall Clock Construction

wood panel back of them gives ample strength.

It is a good plan not to groove the panel upon which the figures are placed, and which becomes the face of the clock. It is better to fit this piece in and fasten metal or wood buttons on the back side so that it can be readily taken off to get at the clock movement from the front.

Make the doors, tenoning the rails into the stiles and grooving both to receive the mullioned framework of $\frac{3}{16}$-in. stuff.

Put the whole frame together, using good hot glue for the joints. When the glue has dried sufficiently to allow the clamps to be taken off, fit the doors and hinge them. Butterfly surface hinges look well and are the easiest to apply.

Thoroughly scrape all the surplus glue off and sandpaper the parts preparatory to applying the finish.

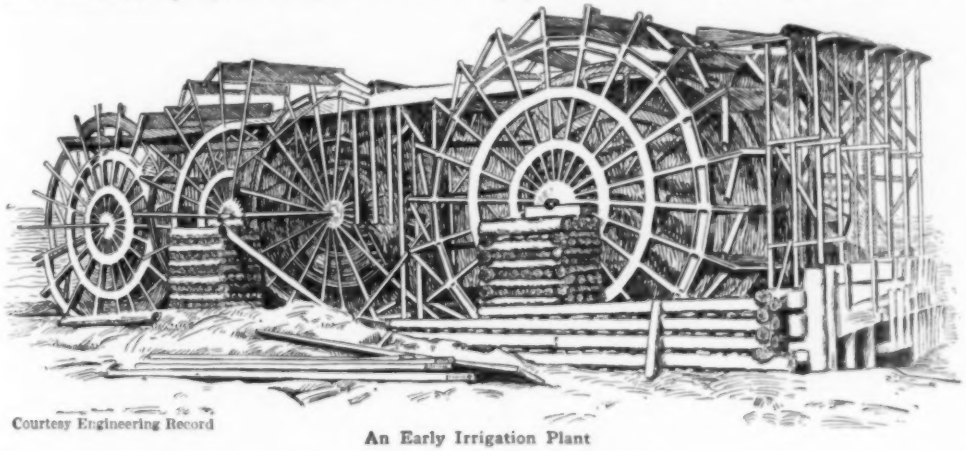
To finish, apply one coat of mission oak water stain. When dry, sandpaper lightly, using No. 00 paper. Apply a second coat, diluted with an equal amount of water. Sand this lightly and put on a very thin coat of shellac to keep the filler color, which follows, from discoloring the high lights. When the shellac has had time to harden, sand lightly and put on a coat of paste filler. Use light filler, colored with umber and Venetian red in the proportion of 12 oz. of umber, and 4 oz. of red to 20 lb. of filler. The directions for applying the filler will be found on the can labels. On the hardened filler apply a thin coat of shellac. Sand the shellac lightly and put on several coats of some good floor wax, polishing well according to the directions on the can. This is what is known as a mission oak finish and is quite popular for this type of furniture design.

The metal figures for the dial come with the clock movement. Some of the movements come already set in boxes of wood so that all one needs to do is to shape the projecting ends of the wood containing boxes and fasten them to the frame with screws from the back. A clock with dial figures, eight-day movement, striking the hours and half hours, with cathedral gong can be bought for $4, possibly less.

China is divided into 18 provinces and the viceroy of each orders his own war material. Eleven of them have procured or have ordered field guns.

UNDERSHOT WHEEL USED FOR IRRIGATION

The accompanying illustration shows the remains of six large undershot wheels used near Minidoka, Idaho, to utilize the power of the Snake river in raising some of its water high enough for use in the irrigation of adjacent lands. The wheels are located about half a mile from the diverting dam of the Minidoka project of the U. S. reclamation service, and are arranged in pairs, in two adjacent parallel rows of three each. If the government canals had not been built they would probably have still been in use.



Courtesy Engineering Record

An Early Irrigation Plant

The method of operation was simple. At the outer ends of each pair of spokes was spiked a paddle, consisting of two boards, 2 by 12 in. in size. These caught the force of the current, and, as the wheel turned, an open-end galvanized-iron cylinder, about the size of an ordinary stovepipe, attached to each paddle, caught the water and raised it to a height of about 30 ft. from which it was carried by a sluice box over the rise of land near the river.

The obliteration of name tags for trees by the weather, a great annoyance to gardeners and foresters, has been overcome by an ingenious label in which the name is burned in and placed beneath the glaze of a small piece of porcelain. It is attached to the bark by an aluminum wire.

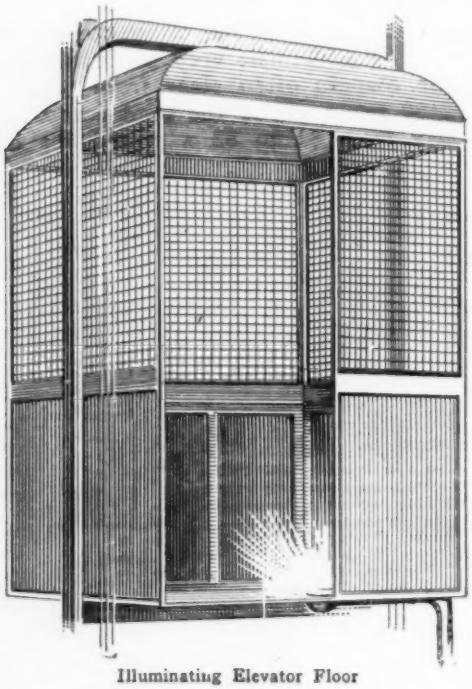
THRESHING CUCUMBERS FOR SEED

Hundreds of acres of irrigated land in Western Kansas and Eastern Colorado are used for the production of cucumber, cantaloupe and watermelon seeds. The growing of cucumbers for seed is said to be very profitable, and the owners often clear from $100 to $150 per acre, as the seed companies pay from $1 to $2 a pound for the product. The cucumbers are sown in rows 6 ft. apart both ways, and the seeds are planted about the first of May. After the plants come through the ground, they are hoed and irrigated, the furrow for the water running lengthwise with the rows and close to the hills. A cultivator is used until the vines run well between the rows.

The cucumber thresher is built on a wagon-like frame, supported by great wide wheels and drawn by two horses. The machinery of the thresher is, in most instances, according to the Gas Engine magazine, operated by a 2-hp. gas engine. The crusher looks like a common cider mill, and has two rollers which crush the cucumbers as they pass between them. The cucumbers go from the crusher into a large cylindrical seeder, which is set horizontally. The outer surface is a wire netting with meshes large enough to permit the seeds to pass through.

FLOOR LIGHT IN PASSENGER ELEVATORS

The elevators of a bank building in Pittsburg, Pa., have been provided with electric lights to illuminate the floor at



Illuminating Elevator Floor

the doorway, so that passengers entering or leaving the cars know exactly the position of the foundation they are about to step upon. The light consists of an electric bulb at the lower right hand corner of the door of the car. When the car stops at a floor, the light flashes and continues to burn until the car starts again. The contact producing the light is made and broken automatically when the door is opened and closed.

THE TROUBLES OF THE AMERICAN MARINE

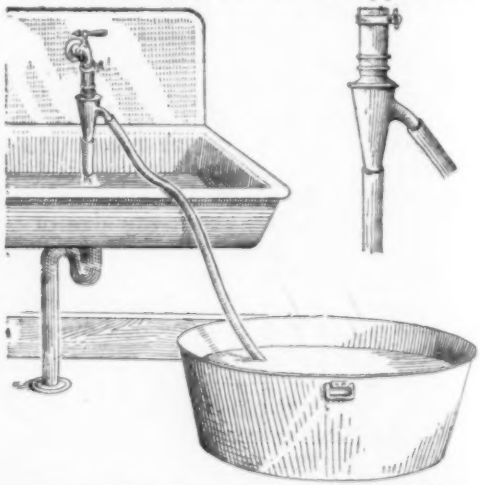
The troubles under which the vessels flying the American flag operate are tersely described in the following paragraph by Robert Dollar, a shipowner of San Francisco:

"It is one thing to build or buy a ship, but it is entirely a different, and more difficult proposition to operate them successfully and make money with them. The American inspection requirements, engine and fire room manning scale, taxes, and extra insurance charged on American vessels by English insurance companies over what they charge for British vessels, make it an absolute impossibility to operate in competition with foreign ships, even if we can buy our ships as cheap as our competitors."

SIMPLE WAY TO EMPTY A TUB OF WATER

It is sometimes very awkward to empty a large tub of water, and many sprains have resulted from attempts to lift tubs to the sink to pour out the contents. The ingenious little device shown in the illustration does the work.

It consists of a conical metal piece attached to a faucet by a rubber collar, and with a long rubber tubing running from the metal piece to the tub of water. Inside the metal piece there is an arrangement that prevents water from running down the long tube from the faucet. When the faucet is opened it creates a vacuum at the upper end



Vacuum Water Lifter and View of Metal Piece

of the long tubing, and the water from the tub mounting up, joins the downward rush of the water from the faucet.

Swing-Span of Mississippi Bridge

SWING-SPAN 460 FT. LONG

The new double-track bridge, built over the Mississippi river at Clinton, Iowa, by the Chicago & Northwestern railroad, has a length of 4,200 ft., but its chief feature is the length and manner of construction of the swinging span. This span is 460 ft. long, and is swung on its central pivot by means of electric power supplied by a power-house on the shore and carried to the bridge by means of a submerged cable.

HOW WATER IS OBTAINED FROM OCEAN'S DEPTHS

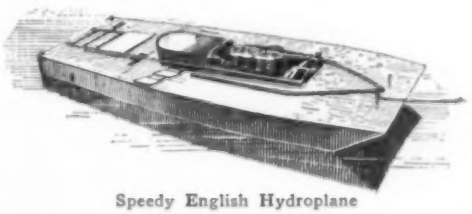
How water is obtained from any given depth in the ocean by a bottle which has to pass through many fathoms of water without other than the water at a given depth entering it is an interesting process. The bottle is a cylinder of brass, German silver, or other metal which resists the corrosive action of sea water, and is generally about 2 in. in diameter and about 12 in. long.

It has upward opening valves at both the top and bottom, connected on a central stem. During the lowering of the bottle the valves are kept open by the passage of the water through the cylinder, the bottle for the time being having practically no top nor bottom. But the moment the descent stops and the bottle starts upward again the valves close themselves, and are locked by the descent of a small propeller in the framework above the upper valve. This propeller rides idly on a sleeve during the descent, but descends along a screw thread to press the valves upon their seats when the line commences to rise. A sample of the water at the depth to which the bottle had descended is thus locked within the bottle and brought to the surface.

SMALL HYDROPLANE MAKES 25 MILES AN HOUR

The curious scow-shaped hydroplane shown in the accompanying illustration is only 13 ft. long, yet makes a speed of 25 miles an hour. Her engine, rated at 15 hp., is set forward of the operator's seat, which is at the back of the box-like opening in the deck.

The little boat was built by a motor-boat firm in Worcester, Eng., for experimental purposes, and is a distinct departure from the familiar ricochet type of hydroplane. The greatest beam

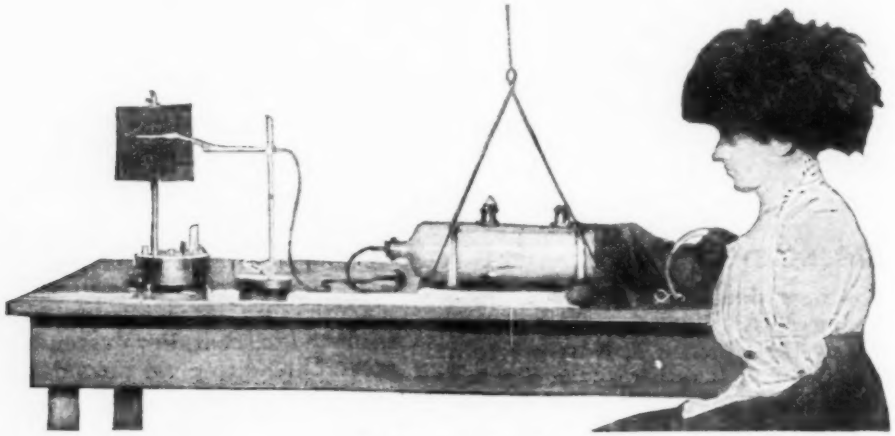


Speedy English Hydroplane

of the boat is 5 ft. 3 in., and the hull weighs but 110 lb. The engine, which is of the 4-cylinder type, weighs 230 lb.

MACHINE REVEALS EMOTIONS

According to Dr. Arthur Holmes, instructor in psychology at the University of Pennsylvania, the machine shown in this illustration indicates the degree of affection of the man or woman who submits to the test. The instrument consists of a large glass tube with rubber sleeve extension, and a series of small tubes connecting with a needle point on an indicator. The large glass tube is filled with water, and the person whose emotions are to be tested places the hand and arm within, the rubber sleeve being strapped tightly above the elbow.



Recording the Emotions

The machine, however, is not only a scientific "she loves me, she loves me not" apparatus, but a device for determining emotions of many kinds. Questions are asked and names are uttered in a conversation with the subject. If a name mentioned, or a question asked, stirs the heart, the indicator mounts upward, but if the names or questions prompt only indifferent thoughts the indicator remains stationary or travels downwards. To be concise, the beating of the heart, whether fast or slow, is transmitted through the pulse to the indicator.

¶A Minneapolis undertaker refused to provide a casket for a pet dog.

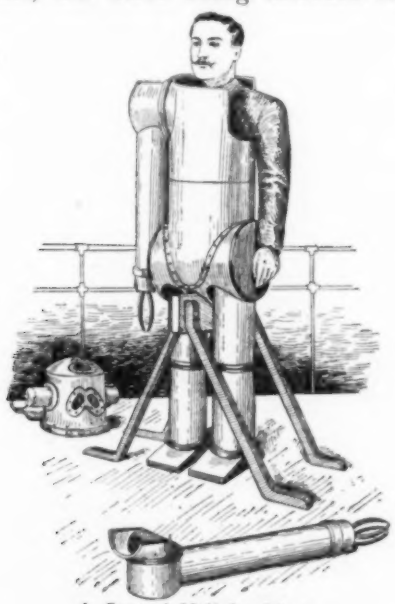
ARMOR PLATE SUITS FOR DIVERS

The curious steel garment shown in this illustration is not the coat of armor of some valiant knight of the middle ages, but the invention of a French submarine engineer for divers. Its purpose is not only to provide the diver with a water-tight suit, but to protect him from the crushing force of the water at great depths. A diver, dressed in an ordinary rubber suit, would be crushed like an egg shell long before he could reach a depth of two or three hundred feet, yet the inventor of this armor, according to a French scientific magazine, has descended to depths of 375 ft. with perfect comfort and safety, an extraordinary feat.

The armored suit is composed of six pieces; the trunk, the head-piece, two sleeves, and two legs. The armor is much too heavy for wear above the water, but, as the diver descends, it becomes lighter and lighter. The prop shown in the illustration is required in donning it. The legs of the suit are placed on each side of the prop and the diver steps into them. The trunk is then placed around him and bolted together, the prop relieving him of its weight during the process. The sleeves are then slipped over his arms

and bolted in position, the head-piece is screwed on, and he is ready for the water. The metal sleeves are so jointed that the diver can swing his arms forward and backward, and the leg joints are so arranged that he can walk in any direction. The sleeves have no joints at the elbows, and incase not only the diver's arms but his hands as well. At the end of each sleeve is a pair of nippers, and these, operated by the hands inside the sleeves, are his means of picking things up.

The suit is self-contained, that is, the air supply is furnished by a cylinder attached to the back of the head-piece. The chemicals within it generate sufficient air for some time. A cable, made fast to an eye riveted to the outside of the armor, leads to a motor-driven drum in a boat on the surface, and this is used to drop the diver into the depths and draw him up. Communication between the diver and the surface is furnished by a telephone, the wires being inclosed in a



A Coat of Mail for Divers

tube covered with rubber. A series of colored electric bulbs at the surface ends of the wires may be used for signaling.

AN AUTO-SEDAN CHAIR

A motorcab that is practically an auto-sedan chair has been built for Mrs. W. I. Twombly, of New York. Its design is unique and the car aroused

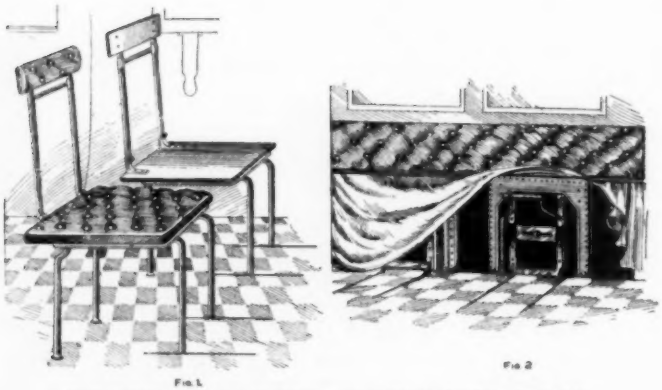
Motor-Driven Sedan Chair

so much curiosity when it appeared on the New York streets that the owner determined to use it no more in this country. Every time the machine has been taken out the crowds had to be dispersed by the police.

The motorcab is little larger than the sedan chairs used two centuries ago, but it has a 15-hp. motor and can run at a speed of 20 miles an hour. Mrs. Twombly, it is said, was measured for the cab just as she would be measured for a new gown, and, as she is slight, most people would find the quarters close. The axle of the forward wheels is directly under the seat, and the cab is driven by a chauffeur on a high seat behind, although Mrs. Twombly may drive herself from inside if she desires. The body sits very low, and entrance is gained from the front. The rear wheels are small compared to the forward set. The whole equipage is only two-thirds as wide as the average automobile.

That the automobile has not yet driven the reliable old horse from his field of usefulness is shown in a report of the Department of Agriculture. The report demonstrates that horses are increasing in number and value.

COLLAPSIBLE AUTOMOBILE SEATS



Collapsible Seats in Position and Folded Against Partition

Collapsible seats, which fold away against the front partition of an inclosed auto body or against the back of the front seats of an open machine, are here illustrated. The first view shows the seats in position, while the second shows them folded up against the front lining boards. The drapery hides them when not in use.

BIRDS FEAR THE AEROPLANE

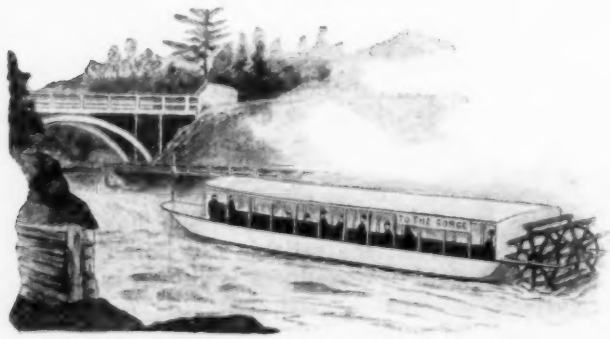
Aviators in France have noticed with much interest the fear of the aeroplane displayed by birds and such animals as rabbits. The arrival of the winged men has invariably been followed by the departure of the birds, but such men as Comte Clary, president of the Saint-Hubert club of France, believe that this will change and that the time will come when flying men and birds will "understand" one another.

To the feathered tribe the aeroplane appears like a tremendous, rapacious creature of the air, and they become panic stricken and promptly leave the region where an aeroplane is operating. Rabbits, and other small ground animals are affected in the same way and flee into the most deserted places. The reason for this fear is instinctive. Small birds and animals in the ages of the past were the prey of the larger birds of the air, which swooped down from above to devour.

Some years ago partridge were bagged in France with the aid of a kite. The birds, seeing the kite flying overhead, took it for a bird of prey, became panic stricken, and hunters approached them without difficulty.

LONG FERRY BOAT HAS DRAFT OF BUT 6 IN.

A ferry boat, which makes trips in a gorge at Victoria, British Columbia, is said to have the lightest draft of any power-driven boat of her size ever built. She is 65 ft. long, 12 ft. wide, and will seat 100 people, yet only displaces 6 in. of water. She is propelled by a stern paddle-wheel, driven by a 17-hp. gasoline engine. The gorge is only navigable when the tide is in, and even then a boat with a draft of more than 6 in. would experience trouble.



Does Not Require Much Water to Float

A MEXICAN SAWMILL

The native sawmills of southern Mexico are still primitive, and consist of a cutting scaffolding and a long saw worked by two men. The log shown in the illustration is mahogany, and the operators of the saw consider the sawing of one board a day's work. Time is considered worth but little in Mexico, and the wages paid the operators of the mill is but 12 cents a day each.

Cutting One Mahogany Board a Day

The pile of lumber in the illustration, if cut at the rate of one slab a day, would have taken a couple of years of labor.

ENGLISH SOLDIERS LEARN A TRADE

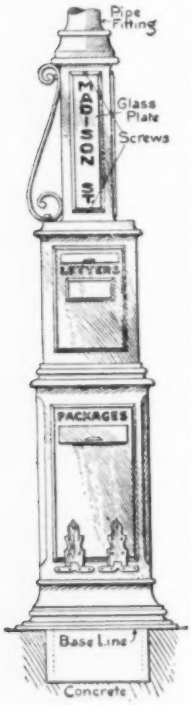
In the past when men who had spent their early years in the ranks of the English army left the service, they as often as not swelled the ranks of the unemployed, as England has more unskilled labor than it can employ. But now, especially in the ranks of the royal marine artillery and the royal marine light infantry, the men have exceptional opportunities of becoming skilled in many trades, one of the most recent of which is that of the chauffeur.

At the Eastney and Forton barracks, classes are instructed in the work of the motor car driver. Each man, after his course of training, is examined by an official of the Royal Automobile Club, and obtains his certificate. As soon as his time expires he is placed on the list for a suitable position. Other classes are instructed in the work of installing and keeping in repair gas and electric systems, and as telephone and telegraph linemen. Classes are also held in painting, carpentering, bricklaying, tailoring, barbering, and other men are trained as waiters, butchers, etc.

This idea of teaching the men trades while they are serving their country as fighting men has a twofold purpose. It provides an incentive for entering the ranks, and insures them a fair opportunity of earning a good living when their time is up and they again become civilians.

A VERSATILE LAMP POST

A lamp post that will serve for many purposes, almost every inch of space being utilized, has been designed for an Indiana town. It will be placed in front of one of the leading hotels. The lower section will serve as a receptacle for mail packages. Above that will be a letter box, with a fire alarm box on the opposite side of the post. On the other two sides the name of the hotel will be placed.



The name of the street will be painted on glass and so placed that an electric lamp will shine behind it at night. And at the very top, of course, will be placed the light. The base will be made of cast iron and imbedded in cement in the sidewalk.

A THREE-HUNDRED-YEAR CALENDAR

By Thomas De Loof

So-called perpetual calendars are not rare, but the one here presented, is, I believe, the most compact yet devised to cover a period of 300 years. It can be put on an ordinary sized visiting card.

The method of using it is best shown by the examples which follow. There are a few exceptions to the general rules, as in the case of leap years, yet by following the system shown in the examples, it can be readily understood For instance:

April 15, 1752 fell on what day of the week?

On the lower card we find that 52 falls under Wednesday. Looking on the upper card we learn that April 5, April 12, etc., fell on Wednesday. Hence April 15, 1752 fell on Saturday.

It is desired to find what day of the week Jan. 6, 1788, fell on. By consulting the lower card it is found that 88, the last two numbers of the year, is in the Saturday column. It must be noted that 1788, being divisible by 4, was a leap year. The months affected by a leap year in this calendar are marked with an asterisk. By looking at the upper card, under Jan.* it is found that Jan. 5, 12, 19, etc. came on Saturday. Hence Jan. 6 was Sunday, coming 1 day after the 5th, which was Saturday.

What day did Feb. 9, 1709 come on? Thursday is the day under which 08 falls. Then 09 would fall under Friday. Hence Feb. 1, 8, 15, etc., were Fridays in the year 1709. Therefore Feb. 9, 1709 fell on Saturday.

January 2, 1903 fell on what day? When looking for a date in 1800, 1900, or 2000, we must advance one column with each century. Hence 1900 falls under Tuesday, and 1903 would be under Friday. Jan. 4, therefore, was Friday, and Jan. 2, 1903 was Wednesday.

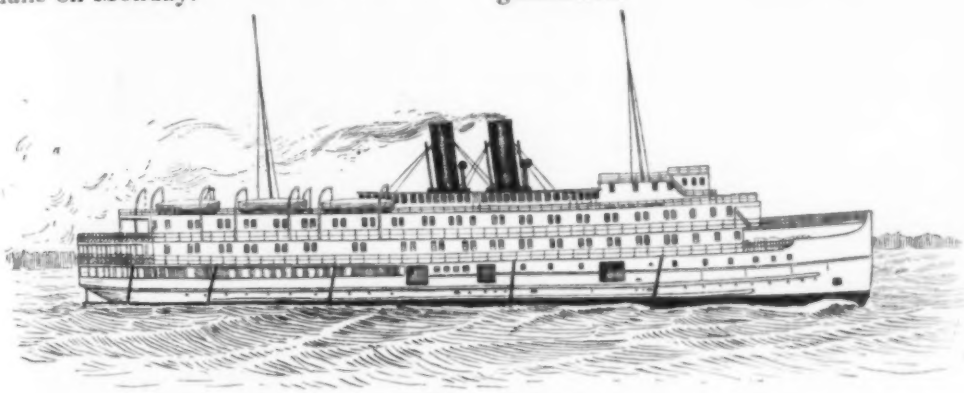
FEB MAR NOV	FEB* AUG	MAY —	JAN OCT —	JAN* APR JULY	SEPT DEC —	JUNE —
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	30	31	—	—	—

MON	SAT	THU	TUE	SUN	FRI	WED
00	04	08	12	16	20	24
28	32	36	40	44	48	52
56	60	64	68	72	76	80
84	88	92	96	—	—	—

1909 - MON ═══ TUE - 1910

This "Perpetual Calendar" Can Be Put on a Visiting Card

By writing down below that 1909 falls under Monday, and 1910 under Tuesday, we can find out almost as easily that July 4, 1910, for example, falls on Monday.



A Floating Skyscraper

SKYSCRAPER RIVER BOAT

The ordinary skyscraper is very seldom accused of being beautiful, and the new skyscraper river steamer "Rochester" will not prove an exception to this rule, although a water instead of a land skyscraper. The builders frankly admit that usefulness and not beauty was considered in its construction. Four of the five decks are given over to staterooms and parlors, while the top, or fifth deck, has an open promenade, a smoking room and an observation room. The 133 staterooms and eight parlors will accommodate 500 passengers.

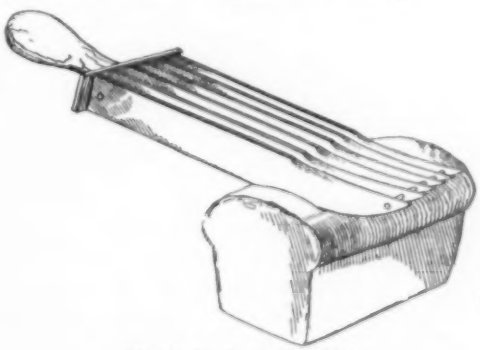
The curious vessel will make the night trip on Lake Ontario and the St. Lawrence river between Rochester and the river ports. Her length is 256 ft., her breadth 43 ft., and her speed is 18 miles an hour.

TRANS-PACIFIC MOTORBOAT RACE

The longest motorboat race in the world will start from San Pedro, Cal., on July 4, and end at Honolulu. The distance is 2,086 miles. The race is open to cruising motorboats whose water line is not over 80 ft. Provisions and water sufficient for 30 days must be carried by each boat. The race is under the auspices of the Hawaii Yacht Club, and the prizes are donated by that organization.

SIX SLICES OF BREAD WITH ONE CUT

The bread knife shown in the illustration would prove a boon in large families where innumerable slices of bread disappear at every meal. In the public restaurants there are more elaborate contrivances for slicing bread. The simplicity of this bread cutter is its most attractive feature. It is nothing more nor less than six knife blades attached on one end to a cross piece to which the handle is fastened, and on the other end jointed by a small, round piece of metal. A piece of strong wire

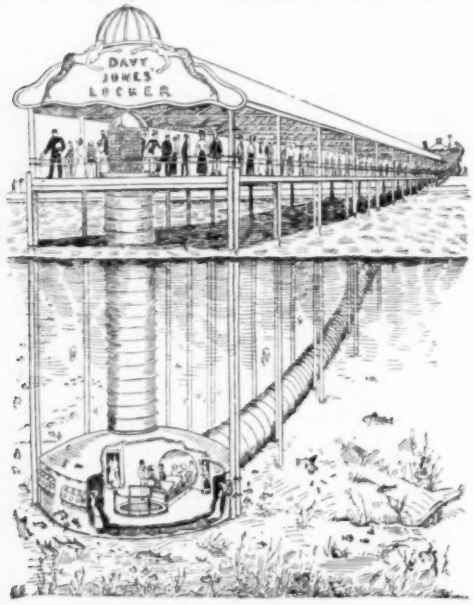


Handy for Large Families

would serve the purpose of the latter, as its function is simply to keep the blades the proper distance apart.

SUBMARINE AMUSEMENT DEVICE

A submarine amusement pier, consisting of an under-water chamber with collapsible entrance and exit



Watching the Fishes

tubes, is proposed for one of the Atlantic coast resorts. The amusement seekers will enter the chamber through the tube leading from the shore, and leave it through the tube rising to the pier above the chamber. Portholes around the sides of the chamber will give a view of the bottom of the sea.

IMITATION TELEGRAPH PLAYS PART IN STORE SALE

The desire of drawing as much attention as possible to a special sale of stock in a large store has led to many unique schemes, but none is more ingenious than the idea recently carried out by a store in Louisville, Ky. The store was turned, for the time being, into a representation of a great telegraph office.

Customers were met at the doors by boys garbed as telegraph messengers, who thrust into their hands yellow envelopes containing imitation telegraph blanks, on which were written various announcements as to quality of goods and prices. All over the store were operators, ostensibly transmitting and receiving messages. White poles, bearing wires, were erected in the aisles, and all sorts of imitation electrical appliances common to a telegraph office were arranged in the show windows and at numerous other points about the store.

QUICK TIME IN BATTLESHIP CONSTRUCTION

The time required for battleship construction is being rapidly reduced. The contract for the "Ohio" was signed in Oct. 1898, and her trial run was in Aug. 1904. The contract for the "Delaware" was signed in Aug., 1907, and her trials were held in Oct. 1909.

AEROPLANE LEATHER DECORATIONS

Metal dragon flies as bizarre decorations for leather goods have been a fad for several years, and it is not a matter of surprise that the success of the dragon-fly aeroplane, the best example of which is the Bleriot machine, has resulted in miniatures being made of

Aeroplane Handbag

it in metal for decoration. Little metal dragon-fly aeroplanes as a decoration for hand-bags are all the rage in Paris at present.

THE OPERATION OF GAS TANKS

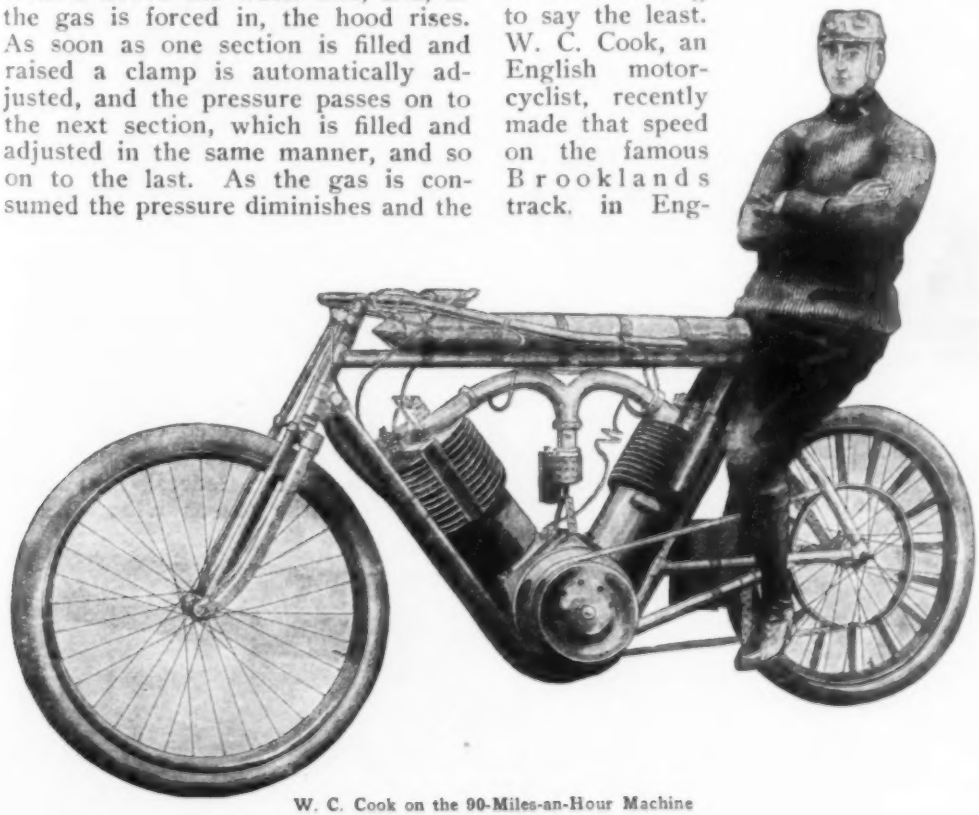
The gas tanks of every large city are huge collapsible hoods that grow larger when inflated and smaller as the gas is allowed to escape. The action is somewhat the same as in the inflation of a balloon, except that the inflation of the gas tank makes it extend only upwards, not swell outwards, as does the balloon.

The tank consists of a cylindrical vessel, made in telescopic fashion, the lower sections always resting in a trough of water, each section being held in place by an invention known as the cup and grip. The gas enters from the base by means of a pipe which mounts above the water line, and, as the gas is forced in, the hood rises. As soon as one section is filled and raised a clamp is automatically adjusted, and the pressure passes on to the next section, which is filled and adjusted in the same manner, and so on to the last. As the gas is consumed the pressure diminishes and the sections of the tank telescope within each other again.

The great tanks are always located as near the water level as possible, low-lying ground being always most desirable. This is because of the specific gravity of gas, which is so light that it would be difficult to supply it properly if the tanks were on elevated ground. This requirement of low ground is just the opposite of that for the distribution of water, the tanks for the latter being placed as high as possible.

NINETY MILES AN HOUR WITH A MOTORCYCLE

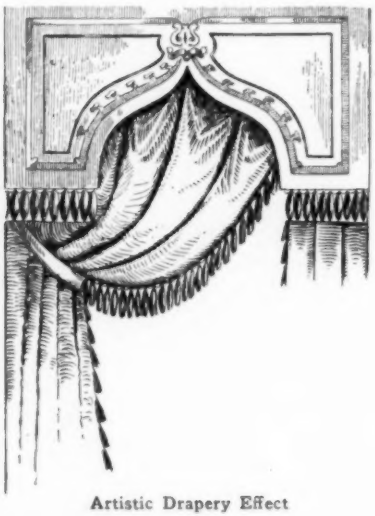
The appearance of a man on a motorcycle going at the rate of 90 miles an hour is said to be hair-raising to say the least. W. C. Cook, an English motorcyclist, recently made that speed on the famous Brooklands track in England. At times, his machine seemed to take flying leaps from the track. His motorcycle develops 20 hp.



W. C. Cook on the 90-Miles-an-Hour Machine

MODERN DRAPERY TREATMENT

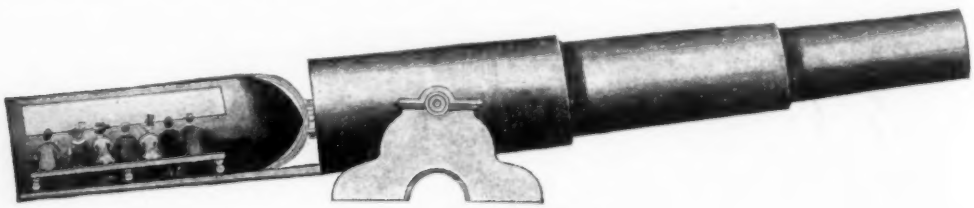
An English drapery effect for the entrances of rooms is shown in this illustration. The central piece is looped back against one side and the background of the top and sides is tapestry. The design is among the latest put out by one of the best known interior decorators of England.



Artistic Drapery Effect

DISCHARGED FROM IMITATION GUN

One of the latest amusement devices provides pleasure seekers with the sensation of being discharged from a huge cannon into the far beyond. The body of the device, which has just been built at Redondo, Cal., has the shape of a coast defense gun, is 138 ft. long and 18 ft. high. The projectile, in which 50 persons can be seated, is slid into the breech and a mechanical concussion occurs. Then follows the sensation of being shot into space. A moving picture device, rapidly moving curtains of clouds on both sides, and the constant movement of the projectile, is productive of the sensations of being hurled through space.



An Imitation Gun Thriller

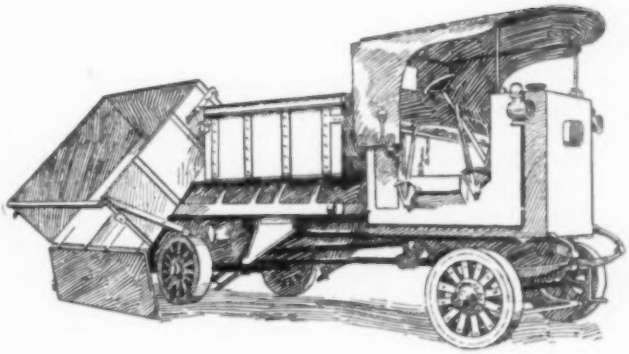
MONEY ORDERS AS ADVERTISEMENTS ANNOY GOVERNMENT

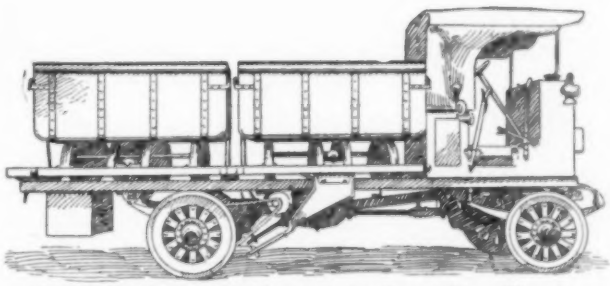
A short time ago a firm in Elgin, Ill., devised an advertising campaign in which postal money orders played a part very satisfactory to the advertiser but somewhat upsetting to the postal authorities. The advertiser secured from the post office about 500 money orders, payable for two cents each, to as many individuals. A form letter was then prepared which notified the reader that his time was probably worth about $10,000 a year, and, as it would take him about half a minute to read the circular, the money order for two cents was sent as payment.

As a result, practically everyone who received a circular read it, but very few of them cashed the money orders, and in a short time the postal authorities were in serious difficulties. Every money order issued, no matter how small, must be entered on the books, and if they are not redeemed in a certain time the federal authorities must know the reason why. Consequently every order not cashed required an investigation. As a result each 2-cent money order purchased by the Elgin merchant represented about a dollar's worth of red tape.

DOUBLE-TIP AUTO DIRT-WAGON

The accompanying illustrations are of a specially constructed auto truck used for the transportation of dirt in Paris. Its most interesting feature is the double-hopper arrangement of the body. The two hoppers have a capacity of 5 tons earth, and may be tipped to disgorge their load either singly or together.





Views of Hoppers in Position and with One of Them Tipped

MOTION PICTURES FROM AEROPLANES

When the great aviation meet is held at Rheims, France, this coming July, a moving-picture concern will have a motion-picture camera taken into the air by an aeroplane for the purpose of taking photographs of the flights from points above the contesting machines. This will be unique, because the films will show the crowds of people and the landscape features under and at the sides of the speeding aerial craft.

The carrying of a motion-picture camera through the air for such a purpose will be, it is believed, the first instance of aeroplanes being used for commercial purposes.

HALF A BILLION WASTED IN SMOKE

The damage and waste caused by smoke in the larger cities of the United States is estimated by H. M. Wilson, chief engineer of the technologic branch of the U. S. Geological Survey, to be $500,000,000 annually, and this figure he says is conservative.

"The present method of burning coal with smoke is unnecessarily costing the people of this country $90,000,000," says Engineer Wilson. "It is estimated that 8 per cent of the coal used in the production of power, light, and heat, or in all about 20,000,000 tons of coal, are going up the chimneys each year in smoke. This coal costs the people at least $40,000,000. It is further estimated that in the production of coke 25,000,000 tons of coal are wasted in the air, and this coal may be said to be worth $50,000,000.

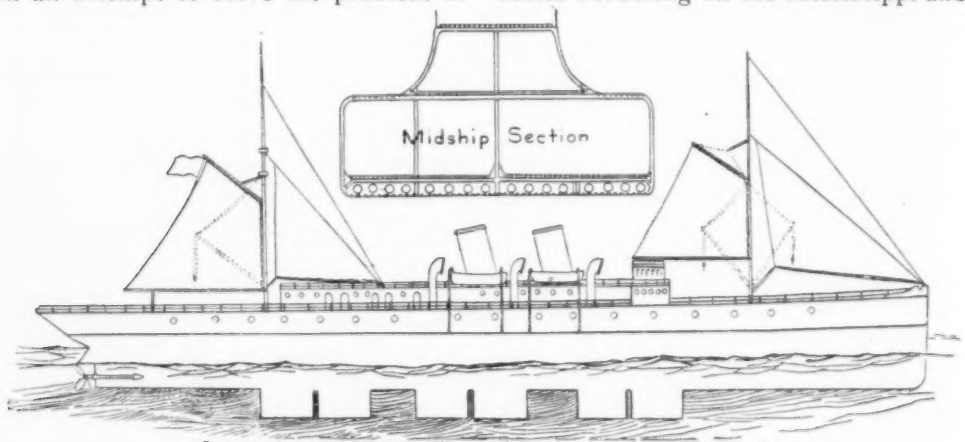
"With this total loss of $90,000,000, due to imperfect combustion, added to the losses due to damaged property, the figure grows to more than $500,000,000. In our great and middle-sized cities live more than 30,000,000 people, and it is these people who suffer the loss shown in the astounding total of half a billion, which means a per capita loss of $17 each year to every man, woman and child. Chicago loses about $50,000,000 each year, Cleveland places her smoke damage at $4,000,000, and

the city of Harrisburg, Pa., shows a loss of $120,000."

The above figures, of course, are statistics from only a few of the cities, and the rest of them would in all probability carry the total estimate even above the half billion mark.

VESSEL DESIGNED TO NAVIGATE INLAND WATERS AND OCEANS

A keel that can be drawn up when navigating shallow waters and lowered to provide stability in deep seas is the secret of a novel craft which has been designed by John F. Cahill, of St. Louis, in an attempt to solve the problem of constructing a vessel that will be equally practical on inland waterways and when crossing the ocean.



Lengthwise and Midship Views of Proposed River-Ocean Craft

Extraordinary light draft, combined with a large tonnage, seaworthiness, safety and speed are claimed for the boat by its inventor. The plans involve a reversal of the general design of large vessels. It is broad at the bottom, and the sides rise straight until above the water line, when they converge, and make the upper part of the vessel but one-half the beam of the bottom.

Double twin adjustable propellers, fitted with special devices for shoal water navigation will allow the craft to turn in its own length.

It would be practically impossible for it to make deep-water trips without some arrangement to add stability, and the adjustable keels are for this purpose. They form the six projections from the bottom of the hull shown in the illustration. They work in sections and are to be so constructed that they can be dropped to a depth of 4 ft. or more at a moment's notice. When not in use the keels occupy small watertight compartments in the hull's center.

TAXING HOUSEBOATS

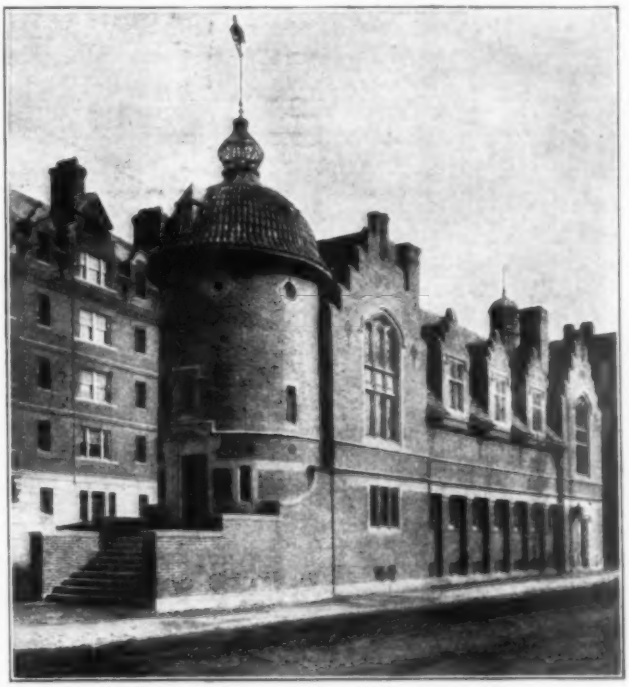
The imposing of a tax on the owners of houseboats is being agitated in the states bordering on the Mississippi and Ohio rivers, the agitators believing that the people who thus take advantage of work expended on the two rivers by the federal and state governments should pay something for the privilege.

It is estimated that there are some 4,000 houseboats on these rivers and their tributaries, and that the occupants of such dwellings number at least 12,000. If a tax is imposed it will have to be uniform in all the states concerned, otherwise many of the houseboats would be moved into the territory of a state that imposed no tax or a relatively small one. A license fee of $7.50 was imposed on river houseboats by Kentucky a few years ago, but it was not strictly enforced because a fee of like nature was not required in the other river states.

STUDENT PUBLICATION HAS UNIQUE BUILDING

The Harvard Lampoon, one of the most famous of the student publications in American universities, has built itself a home which forms one of the most striking buildings of Harvard's group of notable structures. Aside from its unique architectural features, which would draw attention anywhere, it is worthy of note because the only building of any pretense owned and occupied solely by a student's publication. It is built of brick and furnished throughout in keeping with the character of the publication.

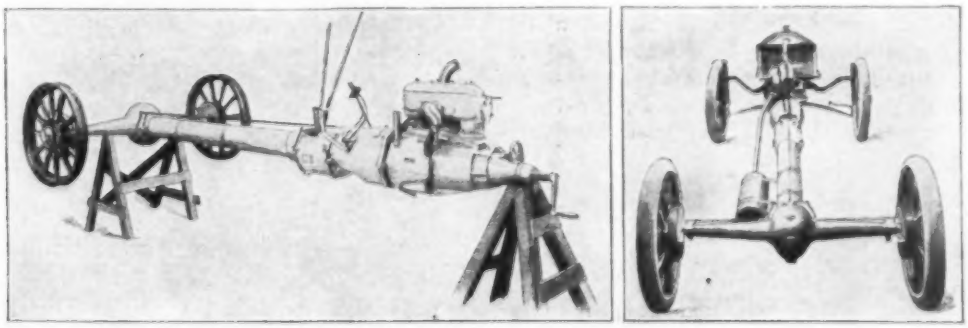
The Harvard Lampoon published its first issue in 1876, and many noted men have been its editors. Above the pinnacle of the tower of the building is an ibis, a bird that is symbolic of the lampoon. It made its first appearance in the fifth volume of the publication in 1878, and from time to time have appeared conversations between the jester "Lampy," and his companions, the slave and the ibis. In 1903 the editorial board created the office of ibis, and since then the bird has had general oversight of the art department.



Striking Building of Student Publication

AUTOMOBILE WITHOUT A CHASSIS

The automobile frame shown in this illustration is designed to do away with as much weight as possible, and in this is highly successful. All necessary propelling apparatus is contained in one rigid tubular envelope. The power is supplied by a 4-cylinder, 12-horsepower engine.



Unique Automobile Frame

DESCRIPTIVE TIME TABLES

Ingenious descriptive time tables have been issued by a western railroad in which the traveler finds, just opposite the figures showing the time of arrival and leaving of trains, a description of the place and the interesting scenes along the route. Between the figures are scenic photographs, as the accompanying reproduction shows. At the top of each page is a diagram giving the altitude of the line at the various points.

Section of Descriptive Time Table

The idea makes the railroad time table a thing of interest instead of dread.

¶Zinc shingle nails, cut from the solid metal, are claimed to be almost indestructible.

OIL WELL TEMPERATURES VARY AT GREAT DEPTHS

That oil, found at a depth of nearly a mile, is not always of a high temperature, as is generally supposed of any liquid taken from such a depth in the earth, is the result of tests made by W. W. Orcutt, manager of the geological department of one of the largest oil fields of California. The varying temperatures found, he says, are the result of chemical action at different spots within the earth.

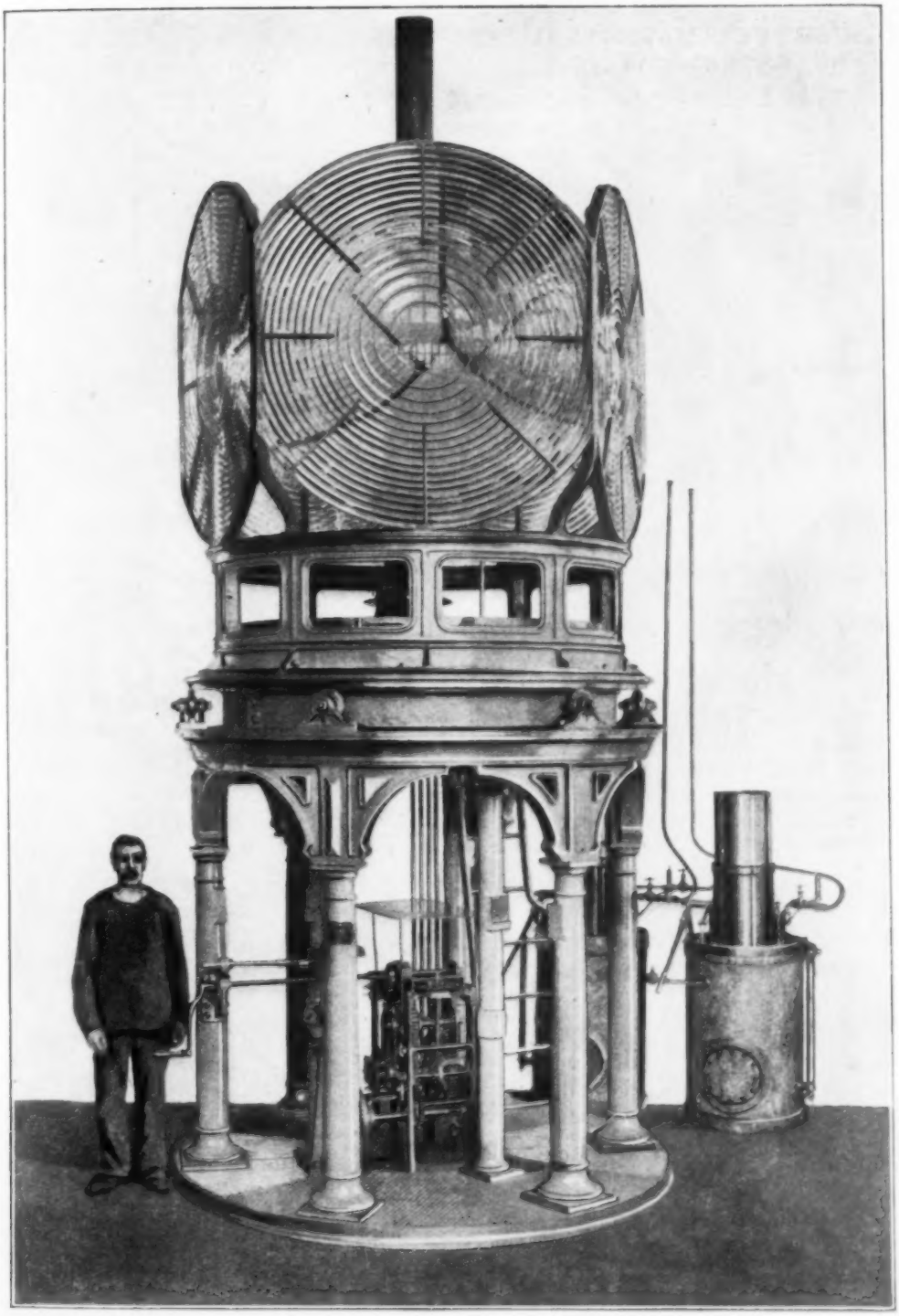
At Rosmary Station, in that state, oil taken from a depth of 4,000 ft. had a temperature not exceeding 80 to 100 degrees, while oil from a depth of 3,000 ft. had a temperature of 140 to 160 degrees. Some oil was secured at 5,000 ft. which had a temperature of 130 degrees. The well is over a mile in depth, 5,390 ft., and it is still being drilled in a 4½-in. pipe.

FLASHING APPARATUS SENDS LIGHT 70 MILES

The accompanying illustration shows a French flashing device for lighthouses that has sent a flash of 150,000 candlepower every 10 seconds, visible within a radius of 70 miles. The flashes are made by the group of five lenses, mounted on a revolving table around a central burner.

The distance a light may be seen on a clear night is, of course, determined by the height of the lighthouse tower. A lighthouse off Brest, France, provided with this type of flashing apparatus, has been observed 70 miles distant. The Belle Isle light, between Newfoundland and Labrador, having a similar flashing device on a tower 470 ft. above high water mark, has been reported by mariners in clear weather at a distance of 75 miles.

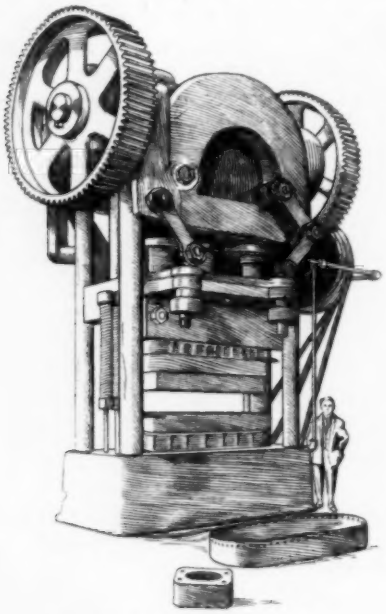
The Canadian government is now erecting a light on the coast of British Columbia that will have a flash of 180,000 cp. The illuminant will be vaporized petroleum supplied at a pressure of 40 lb. per square inch.



Flashing Mechanism Which Throws Beams 70 Miles

HUGE PRESS MAKES SEAMLESS-STEEL CASKETS

This huge toggle double-action drawing press, said to be the largest



Makes Seamless Steel Caskets

ever constructed, is designed for forming large-size seamless burial caskets from 1/16-in. steel, but can also be adapted for making sheet-metal shells, such as automobile bodies, bathtubs, and great steel pots.

The machine stands 20 ft. 2 in. high, weighs 100 tons, and has a total ram pressure of 1,500 tons.

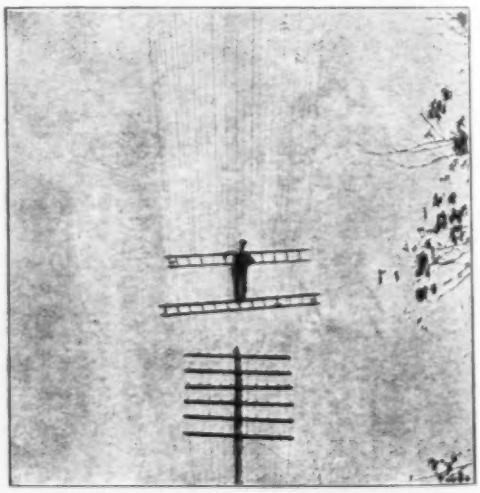
FORESTRY OPERATIONS BY A RAILROAD

The Pennsylvania railroad system, which has planted more than 3,000,000 trees on tracts of land along its right-of-way, is now making a special effort in growing ornamental shrubbery for use in parking the lawns of its stations and unoccupied places along the roadway. To save the time required to grow these from seed, some 6,000 plants have been imported from France and placed in a nursery. Part of them are to be set out this year, and the remainder in 1911. The nursery now contains some 56,000 ornamental trees that are being held until large enough to be set out.

TELEGRAPH WIRES FORM SCAFFOLD

For the purpose of trimming the branches of a large oak tree which interfered with the telegraph wires, a Reading, Pa., lineman adopted a novel method. The oak was between two poles and it was impossible to get at the extreme branches by climbing into the tree.

The lineman ascended to the top of one of the telegraph poles, and drew up two ladders. The first he placed on the wires of the lower level which consisted of ten No. 12 gauge copper wire. After this was in position he placed the second ladder on the wires of the third level, consisting of four No. 12 and six No. 8 gauge copper wires. He stood on the lower one and pushed the top ladder along, then, putting his weight on the top ladder, by clinging with his arms, pushed the lower one forward with his feet.



Traveling by Telegraph

In this manner he worked himself out to the tree and trimmed it. The wires were 50 ft. above the ground.

Covering Demijohns with Rattan

PHILIPPINE POTTERIES

The Chinese residents of the Philippine islands are among the best potters of America's Pacific possessions, and turn out vases and pots of numerous and artistic designs. One of the illustrations shows a half-naked Chinese potter bending over his wheel. Beside him on the bench are several of his vases.

The other illustration shows a number of Filipinos covering pottery demijohns with rattan at a Manila distillery. This rattan is built up around the bulge of the bottle, and the vertical strands are carried to the very top of the neck where they are bound by winding strands.

¶The use of autos saves the British postal service $300,000 a year.

Chinese Potter of the Philippines

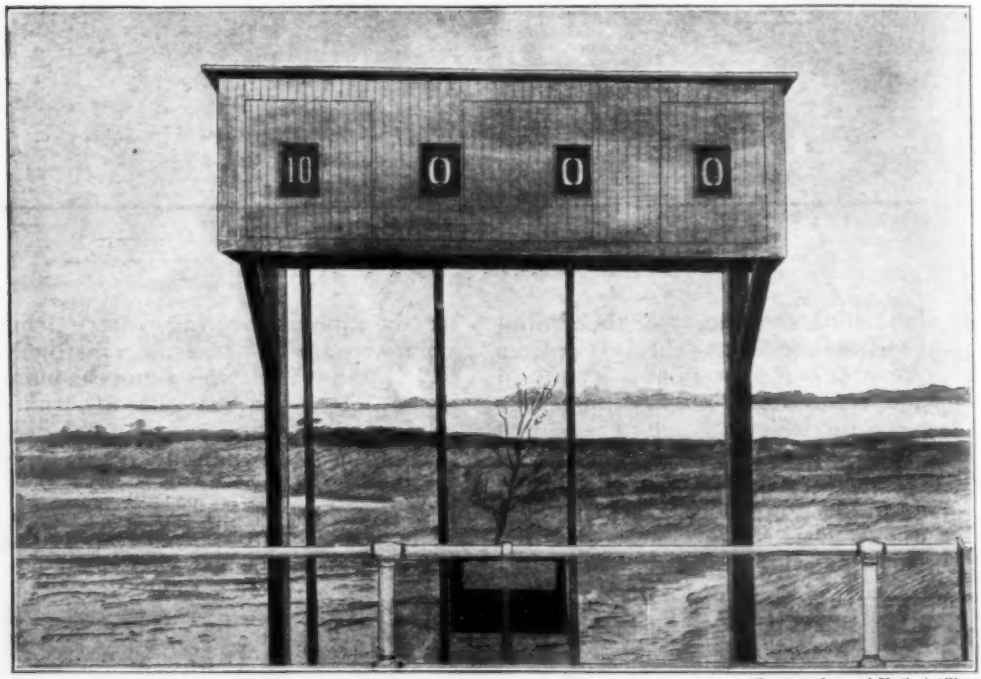
MECHANICAL RANGE TRANSMISSION FOR BIG GUNS

A mechanical range transmission apparatus has been installed at Fort Monroe, Virginia, that not only transmits the range data from the plotting room to the guns, but does so in such a manner that the information is visibly recorded. Tests have proved the device accurate, although simple and inexpensive.

In general, the apparatus consists of three parallel lines of shafting running along the edge of the loading platform. At the end of the shafting is an indicator booth containing three revolving discs. Each disc has 10 faces upon its circumference and is caused to turn on a vertical axis. The booth is shown in the illustration.

The three lines of shafting turning the discs connect with countershafting running into the plotting room. Inside the plotting room, connected to the shafts, are three discs with numerals upon them. The unit figure in all cases being zero, no shafting or disc is required for it. This is clearly shown in the illustration, the zero at the right being without a shaft.

When the range is to be transmitted, the operator in the plotting room turns his discs until the numbers he desires to transmit to the battery are uppermost. The turning of the discs revolves the shafts, and the number at the top of each disc is reproduced on the display face of the booth. The figures displayed in the illustration give the range as 10,000 yd.



Mechanical Range Announcer

Courtesy Journal U. S. Artillery

SHEARS WEIGHING 112½ TONS

Two pairs of shears recently installed at the great steel plant at Gary, Ind., for cutting steel, are said to be the largest shears of the lever type ever built. They have knives 3 ft. long, and will make 12 cuts per minute, cutting off cold steel 6½ in. square or 7 in. round. The total weight of each pair of shears, not including its 150-hp. induction motor, is 112½ tons.

HEAT

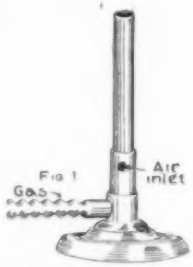
PART IV—The Production and Uses of High Temperature

By J. Gordon Ogden, Ph. D., Professor of Physics, Fifth Ave. High School, Pittsburgh

[This is the fourth article of a series by Dr. Ogden, in which well known subjects will be discussed from the standpoint of their relation to modern mechanics. In the February number "The Nature of Heat and How It Is Measured" was discussed; the March article told "How Low Temperatures Are Produced," and in the April number "Some Effects of Low Temperature Upon Matter" were described. Succeeding articles will include Steam, Boilers, Ice, Radiation, etc.]

THE most remarkable and the most valuable discovery ever made by man is that of fire. Prior to that epoch-making gift from the gods, man was brother to the brute, and his splendid possibilities were embryonic. With the coming of fire, came all the wonderful development that has enabled man to assert and defend his claim as the lord of creation.

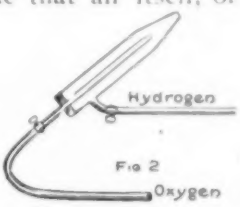
Fire has done more for civilization than all the armies, libraries, and treasures of antiquity. It has been only within comparatively recent years, however, that man has been able to harness the steed of high temperature to the wheels of progress. Before that time he was unable to go much further than 3000° F, and all the magic properties of fire at temperatures up to 7000° F were unknown to him. Now he is able to command substances hitherto infusible, to melt, and to make combinations unheard of outside of the tremendously hot furnaces known as volcanoes.



The Bunsen Burner

We are now able to emulate the volcano so far as heat is concerned in our laboratories, and we are even possessed of the almost magical power of welding steel rails right in the street where they lie. The apparatus and contrivances by which these wonders are produced are simple—so simple that it is a marvel indeed, that man has permitted five score of centuries to go by, before he made up his mind to use them.

Some carbon compound, such as wood or oil, has been used from time immemorial for the production of heat. With the development of chemistry, man has learned the exact nature of the combinations necessary to the scientific and economic output of caloric energy. For example, he understands the importance of an abundant supply of the element oxygen, and the Bunsen burner typifies his advance in this respect. A little over a century ago, the discovery was made that air itself, or rather its oxygen, was just as important in the production of heat as carbon and hydrogen. Air contains about 21 parts of oxygen, and 79 parts of nitrogen. When the proportion of air supplied to the flame is artificially increased as in the case of the Bunsen burner (Fig. 1), the heat thus obtained is far beyond that produced by the burning of illuminating gas alone. It is this richer mixture that renders possible the excellent and cheap light produced by the glowing of the oxides of thorium and cerium in the ordinary incandescent mantle so common in our households.



The Oxy-Hydrogen Blowpipe

Instead of using more air, as in the case of the Bunsen burner, man has tried the effect of using pure oxygen itself in combination with hydrogen, and the exceedingly hot flame of the oxy-hydrogen blowpipe (Fig. 2), is the result. This flame is so hot that the ordinary metals such as lead, tin, zinc, iron, and even platinum will melt in it quite readily. A novel and profitable industry has sprung up in Paris, that of the manufacture of artificial rubies. A ruby, after all, in spite of its exaggerated value, is not such a wonderful thing, if we consider its composition

Copyright by H. H. Windsor

alone. It is just plain, ordinary clay, containing a trace of chromium. This clay, however, differs from ordinary mud in that it is crystallized. Figure

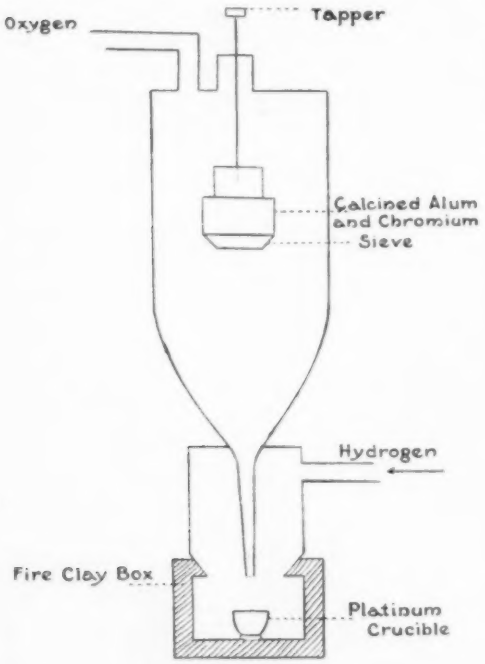


Fig. 3
Ruby Furnace

3 shows diagrammatically the simple apparatus which transforms a few grains of worthless clay into a genuine ruby.

At the top of the furnace shown in the diagram, a little calcined alum, mixed with the right percentage of chromium-oxide to give it the true ruby color, is placed on a fine sieve, which is gently tapped at regular intervals by an appliance operated by an electro-magnet. This causes the powder to sift down through the oxygen gas where it finally meets the hot zone made by the combination of the two gases hydrogen and oxygen. The temperature of this zone varies from 3300° F to 3600° F. The powder fuses and drops into the platinum receptacle, and as each drop falls, it unites with the others in the dish, thus forming a pear-shaped ruby resting on its stem. Each blowpipe has an output of about eight to ten carats per hour, and a single operator can attend to a dozen blowpipes. Rubies weighing 80 carats can thus be built up. These rubies, after they have cooled, are split lengthwise. They are cut and polished, the final polishing being done with tripoli and water. The cut gems ready for the market are worth about 40 cents a carat.

This price is insignificant as compared with that of the natural Burmah ruby, whose market value is almost fabulous. Chemically, optically, and physically the "scientific" rubies are identically the same as the natural stones. Even in both forms, the slight microscopic air bubbles called "frogs" or "inclusions" are present. Lacroix, the eminent geologist and mineralogist, asserts that the artificial ruby cannot be distinguished from the natural, while Pinier, a leading gem expert of Paris, claims that they can readily be distinguished. At any rate the pawn brokers of Paris have placed rubies under the ban, and it is almost impossible to secure loans when rubies of any description are offered as security.

Fire is the great natural purifier of metals, and we are learning more and more about its use and misuse in the industrial world. We have been a long time learning. Thousands of years ago fire was used in the reduction of metals from ores, and the bible contains many references to metallurgical operations. We are told that the finer sat before his melting pot and when he saw his face reflected in the beautifully clear mirror of silver, he knew his task was finished. Many references are made to the refining of gold, and Job tells us of the "brass that was molten out of stone."

Fire is a good servant but a bad master. That curious substance called steel is an example of this fact. Too much fire is as bad as not enough, and sharp-eyed chemists pounce upon a sample from every melt to learn just what the fire has done, and to decide whether the product of the converter shall be made into razor blades or ploughshares. Just a little more or less

of that queer element known as carbon and the entire nature of the steel is changed. The late Sir William Austen-Roberts in an address before the students of the Royal School of Mines, said: "If the thousands of tons of steel in the Forth bridge had contained two-tenths less of carbon, the material would have been worthless. Thousands of tons of copper would be useless if it contained a trace of bismuth, and the eighty millions sterling of gold coin in circulation would have crumbled away if it had contained one per cent of lead."

Boiling steel, whose temperature is in the neighborhood of 3500° F is rather hot, but a temperature far beyond that may readily be obtained by the use of the new compound known to science as thermit. This substance is easily made and consists of a mixture of iron oxide, and finely granulated aluminum. If this compound be mixed with a little magnesium and barium-dioxide to supply the necessary heat to start the combustion, or simpler still, if an ordinary storm match be thrown into it, the aluminum and oxygen will unite with frightful energy, and the consequent evolution of an enormous amount of heat.

Almost instantly the temperature of the oxide of aluminum and pure iron thus formed rises to about 5500° F. The explanation is simple. Aluminum and oxygen are exceedingly fond of each other in a chemical sense, and it is an extremely difficult matter to break up ordinary clay, a combination of aluminum and oxygen, into the elemental substances, so intense is the chemical affinity which holds them together. Only a very high temperature can do this. Conversely then, when we place the elemental substances aluminum and oxygen in such circumstances that they will readily combine, the same amount of energy that would afterwards be required to separate these two allies, will be set free, and will appear as the lowest form of energy-heat. We see the same principle illustrated when we turn water at the boiling point into steam at the same temperature. An enormous amount of heat energy is required to change water at 212° F into steam at 212° F. Conversely, when steam is permitted to change back into water, this heat energy is given off, although both the steam and water are just 212° F. In other words, whether the special form of energy be known as heat, light, magnetism, or gravitation, one form may readily, under the proper conditions, change into the other, and the lowest form is always heat. Thermit is invaluable where a very high temperature is needed, in spots, as in the repair of broken shafts, castings, the welding of iron, and the making of continuous rails. It is also invaluable in the production of certain metals, such as vanadium and chromium, so essential to the manufacture of special steels. If instead of iron oxide, we use vanadium oxide, or chromium oxide, the aluminum reduces the oxygen and sets free the pure vanadium or chromium.

The next step-up in temperature is produced by the electric furnace. In this wonderfully simple contrivance, the highest temperatures known to man are easily produced. Again do we meet with the principle that energy may readily be transformed from one form to another, the lowest step being heat. A current of electricity flowing through a wire meets with resistance. In some unknown way the copper or carbon, although commonly known as good conductors, present some molecular difficulty to the passage of the electricity and the electrical energy is transformed into heat. The glowing filament of the ordinary incandescent electric lamp is evidence of this. If the current be heavy, and the circuit wires where the gap is made be tipped with carbon, the electrical energy will jump across the gap, overcoming the enormous resistance thereby put into the circuit. This resistance results in the transformation of the electrical energy into heat and light. This is shown in the ordinary arc lamp now used so commonly in the illumination of our highways.

An electric furnace is simply a

gigantic arc lamp, whose temperature is from 6000° F to 7000° F. Into this enormously hot zone (Fig. 4) various substances are placed, and its effect

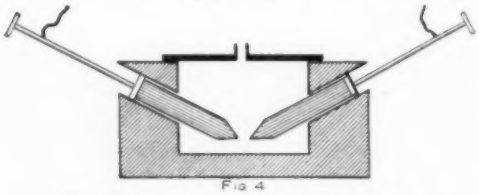


Fig 4

The Cowles Type of Electric Furnace

upon hitherto infusible compounds is little less than magical. Coke, clay, sand, carbon, which have hitherto been unmastered by man are broken to his bridle, and become willing draught horses, which do his bidding in the host of industrial uses to which they may be put. Quicklime and coke are readily converted into calcium carbide, that valuable substance which upon the addition of water forms the powerful illuminant, acetylene.

Coke and sand, when fused in the electric furnace, give us carborundum used so much as a polisher and abrasive. The electric furnace is also used in the manufacture of aluminum, carbon-disulphide, artificial graphite, phosphorus, and many other substances of great value to man. It has only been a few years since Moisson astonished the world by the manufacture of genuine diamonds. These diamonds, it is true, are of microscopical size, but the fact remains that they are genuine diamonds. Moisson placed some pure carbon in an iron cylinder (Fig. 5) and then immersed the cylinder in a mass of boiling iron. Since molten iron absorbs carbon like water dissolves salt,

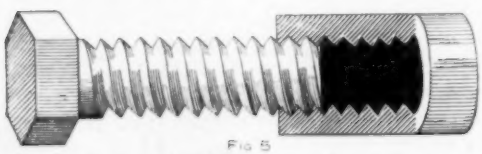


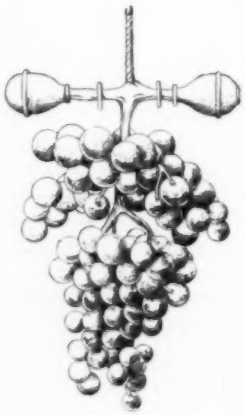
Fig 5

Moisson's Iron Cylinder for the Manufacture of Diamonds

the cylinder became completely saturated with carbon. Then he plunged the whole fiery mass into ice cold water. The enormous pressure produced by the contraction of the outer mass of the iron upon the uncooled interior caused the dissolved carbon to separate into tiny crystals—real diamonds. Some day, possibly, we shall learn how to do the same thing that Moisson did, except that we shall use two or three hundred pounds of metal instead of a few ounces, and possibly, who knows, we may be able to supply diamonds in commercial sizes, even as we are now able to satisfy our taste for rubies, at a price within the reach of all.

GRAPES KEPT FRESH FOR MONTHS

Grapes, to be kept fresh, must not be allowed to dry up, and, on the other hand, they must not be immersed in water or handled. Consequently, a French firm, which makes a specialty of fresh grapes out of season, has devised a plan by which a bunch of grapes may receive moisture in the same manner as while on the vine.



In cutting a bunch of grapes to be kept fresh, an inch or two of stalk is left on each side of the twig that bears them, and to each end of this stalk is fitted a bulb of rubber or glass containing sterilized water. The whole is then hung up where the grapes will swing free, and the water in the bulbs is sucked up by the stalk. The water can be renewed as often as necessary without touching the grapes.

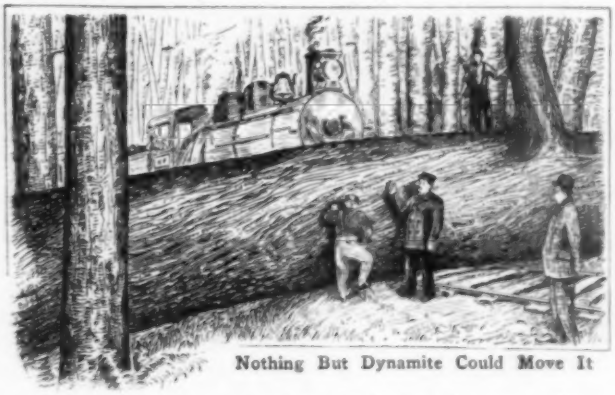
It is said that freshly picked grapes can be kept fresh for a period of two or three months by this process.

¶There are about 275,000 automobiles owned by individuals in the United States, or one for every 400 population.

HUGE TREE BLOCKED RAILROAD TWO DAYS

A giant red fir tree, standing on the west slope of the Cascade mountains, was recently blown down, falling across the tracks of the Northern Pacific railroad, where it blocked traffic for two days. Its monster trunk measured 9 ft. in diameter, and, as there was no saw in that part of the country large enough to cut through it, and chopping would require many days, the wrecking crew set to work to dynamite it.

A number of auger holes were bored into it and these were filled with dynamite. The explosion splintered the trunk to such an extent that it could be removed, and also tore up the track for some distance. The rebuilding of the roadbed, however, was considered but a small task as compared to the removal of the tree by other means than dynamite.



Nothing But Dynamite Could Move It

MOVING-PICTURE SHOWS HURT CANDY TRADE

It is very seldom that two kinds of business, absolutely foreign to one another, seriously conflict, yet such a state of affairs exists between the moving-picture shows and the candy business, and the latter is suffering heavily, according to a moving-picture journal. The reason lies in the fact that the patronage of children is relied upon to a great extent by both lines of business, and that five-cent pieces are not numerous enough for the enjoyment of the two pleasures.

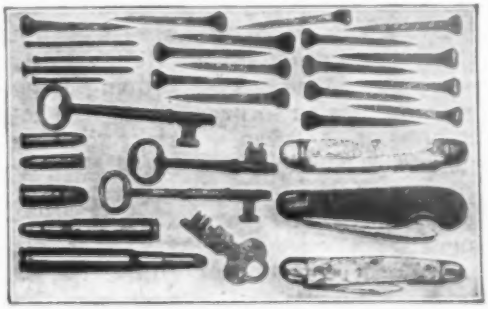
Candy salesmen and proprietors of small stores say that children are giving up candy for the moving pictures. Some salesmen assert that the picture business is cutting into all classes of candy trade. The child with one or two pennies saves them until five are gathered, instead of disposing of them one at a time for candy, and spends the five to see the moving pictures.

STOCK OF HARDWARE IN STOMACH CAUSED OPERATION

In the February issue of Popular Mechanics there is an article about a human ostrich. I feel quite sure that a case brought to light by a recent operation at the Mercy Hospital of North Bend, Ore., goes the human ostrich one better.

The operation was made necessary by the presence in the stomach of R. F. Durga, of a stock of hardware and a number of coins sufficient to start a merchant in business in a small way. It was the result of 20 years of a freak metal diet.

The following articles were removed from the stomach; five rifle shells, three jack knives, four door keys, 17 horseshoe nails, four six-penny nails, one fish hook, 14 dimes, three nickels, four ounces of broken glass, one plate from the handle of a pocket knife, and the end of a jointed rod.—Contributed by W. L. Edwards, North Bend, Ore.



Some of the Hardware Taken from Stomach

ANCIENT AQUEDUCT AT QUERETARO, MEXICO

Famous Mexican Aqueduct

This great arch is one of many forming an aqueduct that brings water from the mountains to Queretaro, the Mexican community known as the "City of Opals." It is said that the aqueduct was built as the result of a banter between two wealthy citizens, one of whom offered to conduct the water from the distant springs if the other would build from solid silver an elaborate shrine and statue of a saint. The offer was accepted and the agreement was carried out to the letter.

In the plaza of the city stands a monument to the builder of the aqueduct, which has stood since 1738. Time has softened the hardness of the structure, until it is now as much a part of the landscape as the mountains.

TORPEDO BOATS WITHOUT FUNNELS

By means of a special system of electrical ventilators, an Italian naval designer has succeeded in doing away with funnels on torpedo boats. To accomplish this it was necessary to make some radical modifications of the engines, which the Italian government is keeping secret. In addition to offering a target to the enemy, the funnels are often responsible, during gales, or heavy rain, for partial extinction of the furnace fires. The first trial trips of a torpedo boat, equipped with these ventilators, proved the utility of the invention.

CALCIUM CARBIDE AS A SPRAYING GAS

Calcium carbide has found a new use in gas-pressure sprayers, used for destroying all kinds of pests which attack fruit and shade trees, and for such purposes as spraying turpentine and zinc-white on the inside of boiler feed-tanks, for spraying disinfectants, and for painting and distempering. More than 5,000 of the sprayers are now in use in Australia, mostly for spraying trees. The apparatus consists of two iron cylinders, in the larger of which is contained the liquid to be sprayed, while in the smaller the carbide calcium gas is made by the dripping of water. The two cylinders are fastened together, and riveted to withstand a pressure of 200 lb. per square inch.

The popularity of the sprayer in Australia has caused the importation of

calcium carbide to jump from 2,000 tons four years ago to 8,000 tons a year at the present time. A scheme is now on foot to produce the carbide in Australia itself. A plant will probably be erected at Cairns, Queensland, and the electric power to operate it will be generated at Barron Falls, some 19 miles distant.

ELECTRIC MACHINE PICKS AND CLEANS COTTON

The electric cotton-picking and cleaning machine shown in these illustrations has been recently tried out, with success it is claimed, in Mississippi. Unlike the majority of cotton-picking machines that have appeared in the past few years, this machine is not an automatic picker, but requires boys or men to handle its picking units. The cotton is extracted from the boll by means of an electric brush and suction nozzle, and is then carried through a separator, where it is thoroughly cleaned, and finally deposited in a basket on the truck. Each man or boy picker carries one of the brushes and nozzles, 16 of which can be used on one machine.

A Side View of the Machine

It is claimed that one picker, provided with this electric aid, can pick over 500 lb. of cotton a day, and that every boll is picked clean. With all 16 units working, the capacity of the machine would be over 8,000 lb. a day.

The Picker at Work

The average negro cotton picker does not exceed 100 lb. a day.

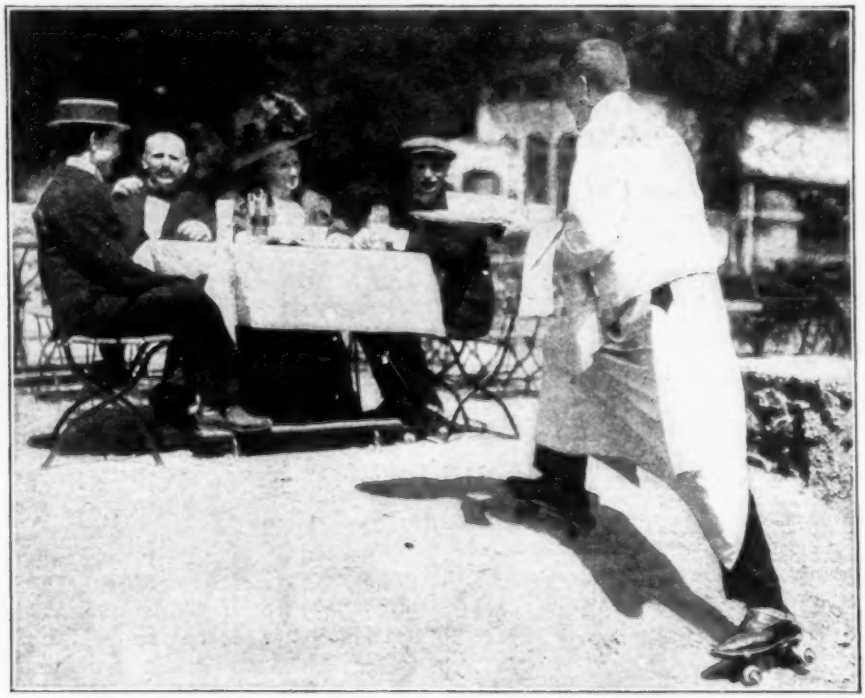
The machine is mounted on a 4-wheeled truck and moves along between the rows of cotton under its own power. It is provided with electric lights so that picking can be carried on at night as well as in the day time.

FIREWORKS REPLACE SCARECROWS

The great grain fields of the Sandborn ranch in Shasta country, California, are ingeniously protected at night from the vast flocks of wild geese and other aquatic fowl that do immense damage to crops, by means of a display of fireworks. Skyrockets and Roman candles were bought in large quantities by the management of the ranch, and men are stationed at various points. Whenever a flock is heard "honking" in the distance, several skyrockets or a shower of colored balls from a Roman candle are sent upward, and, as a result, the birds give the ranch a wide berth.

WAITERS ON ROLLER SKATES

That the roller skating craze is on in Europe with great enthusiasm is graphically illustrated by the accompanying photograph. The scene is in a garden restaurant in Berlin where the waiters serve the patrons on roller skates. The distance between the tables and the source of the food and drink supply is considerable, but, shod in this manner, the waiters practically constitute a quick service brigade.



Serving on Roller Skates

ATTEMPT TO RECOVER TREASURE FROM LAKE SHIP

Periodically an expedition sets out in an attempt to recover riches from a treasure ship sunk in the ocean during the last hundred or so years, but that a real treasure ship lies at the bottom of one of the Great Lakes, and that an expedition is now trying to recover the riches from it, comes as a surprise to the majority of people.

The expression "treasure ship" is usually associated with the times when pirates roved the sea, and Spanish galleons, laden with gold and silver, sailed the main, but just such a ship, although propelled by steam engines and unromantic to look upon, sank in Lake Huron in 1865, nearly 45 years ago.

The ship in question was the "Pewabiac," at that time the fastest craft on the lakes, and her treasure consisted of $365,000 in gold, $15,000 in currency, and 380 tons of copper ingots. An expedition, financed by a syndicate of New Yorkers has just left Detroit, Mich., on the steam barge "Douglas" to try and recover the treasure, after succeeding in locating the sunken hull last year. The ship was located twice before, in 1877 and in 1894, and attempts were made to gain the treasure, but the result has always been tragic. Up to the present attempt the loss in the quest has been five lives and about $85,000. The vessel lies in 160 ft. of water.

The "Pewabiac" was sunk about 18

miles east of Alpena, which is on the western shore of Lake Huron, by her sister ship, the "Meteor." She had sailed from the ports on Lake Superior and the northern part of Lake Huron with the treasure above mentioned, and 175 first-class passengers. The great amount of money she carried was destined for the eastern banks, after having been secreted in the northern regions during the war, when it was feared that the Confederacy would invade the states lying nearest the dividing line. The "Meteor" was bound north. In those days it was customary for passing ships to draw close together for exchange of mail and news, as there were then no railroads or telegraph lines in northern Michigan. As the boats approached each other the deckhands made ready to heave the bags of mail across the narrow space of water, but suddenly the "Pewabiac" swerved and the "Meteor" crashed into her side. Some 30 of the passengers saved themselves by climbing onto the "Meteor" before she backed away, and a few more kept afloat until picked up by the boats, but 115 were never heard of again.

The present expedition of treasure seekers is attempting to reach the prize by means of specially constructed diving suits, the invention of one of the members of the syndicate.

ELECTRICALLY OPERATED FLOATING DOCK

The large floating drydock of 11,500 tons capacity near Antwerp, Belgium, is pumped by seven centrifugal pumps direct coupled to electric motors. So powerful are these high-speed pumps that they can raise the loaded dock in 90 minutes. Hoisting apparatus, machine tools, and other labor-saving devices are also operated by electricity.

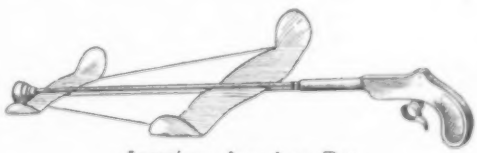
The dock has a total weight of 4,300 tons, built in two sections, one 277 ft. long, and the other 207 ft. The walls are 30 ft. high, the total width is nearly 100 ft., and its total lifting capacity is 23,000,000 lb.

LOVING CUP OF TIN UTENSILS

When the tinsmiths' union of Toronto, Canada, held its annual banquet recently, the president of the organization was presented with this unique loving cup, which represents several of the utensils carried in every tinware shop. The base is formed by a 3-pt. basin, ornamented with a brass nameplate, and this is surmounted by the tapering part of a tin teapot breast. The middle section is fashioned from three stamped teapot spouts, and supports a 2-qt. basin which forms the bowl of the loving cup. The handles on each side are the ordinary handles of tin cups, and the whole forms a very artistic piece of work.

AN AEROPLANE DART

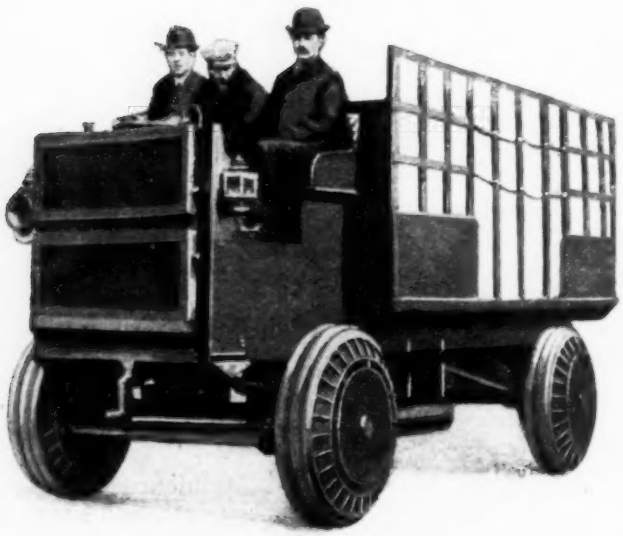
One of the most popular children's toys in Paris at the present time is the aeroplane arrow or dart shown in the accompanying drawing. The same toy, minus the wings, has been on the market for a number of years, but the addition of the wings has more than doubled its popularity. The dart is projected by means of a spring in the barrel of the pistol, it being compressed when the end of the dart is inserted. The pulling of a trigger releases the spring and the dart rushes on its journey toward the target. The rubber



Ingenious Aeroplane Toy

tip, which is hollowed out, creates a vacuum within itself when it strikes the target and holds the dart in place where it strikes.

A MOTOR IN EVERY WHEEL



Truck with Motor Wheels

A heavy motor truck that has a motor in every wheel, any one of which can be used separately, is being manufactured in Denver, Colo. Not only does each wheel have its own power, but its steering gear as well, so that both the forward and rear wheels can be utilized in making turns.

The illustration of one of the wheels with its hub cap and disc removed, shows the arrangement of the motor. The ball bearings upon which the wheel turns, and the armature, are clearly seen. The other illustration shows one of the trucks in operation.

The truck carried the load seen in the illustration and easily dragged two loaded trailers on level road with only two of the motor wheels operating.

The Motor Within the Wheel

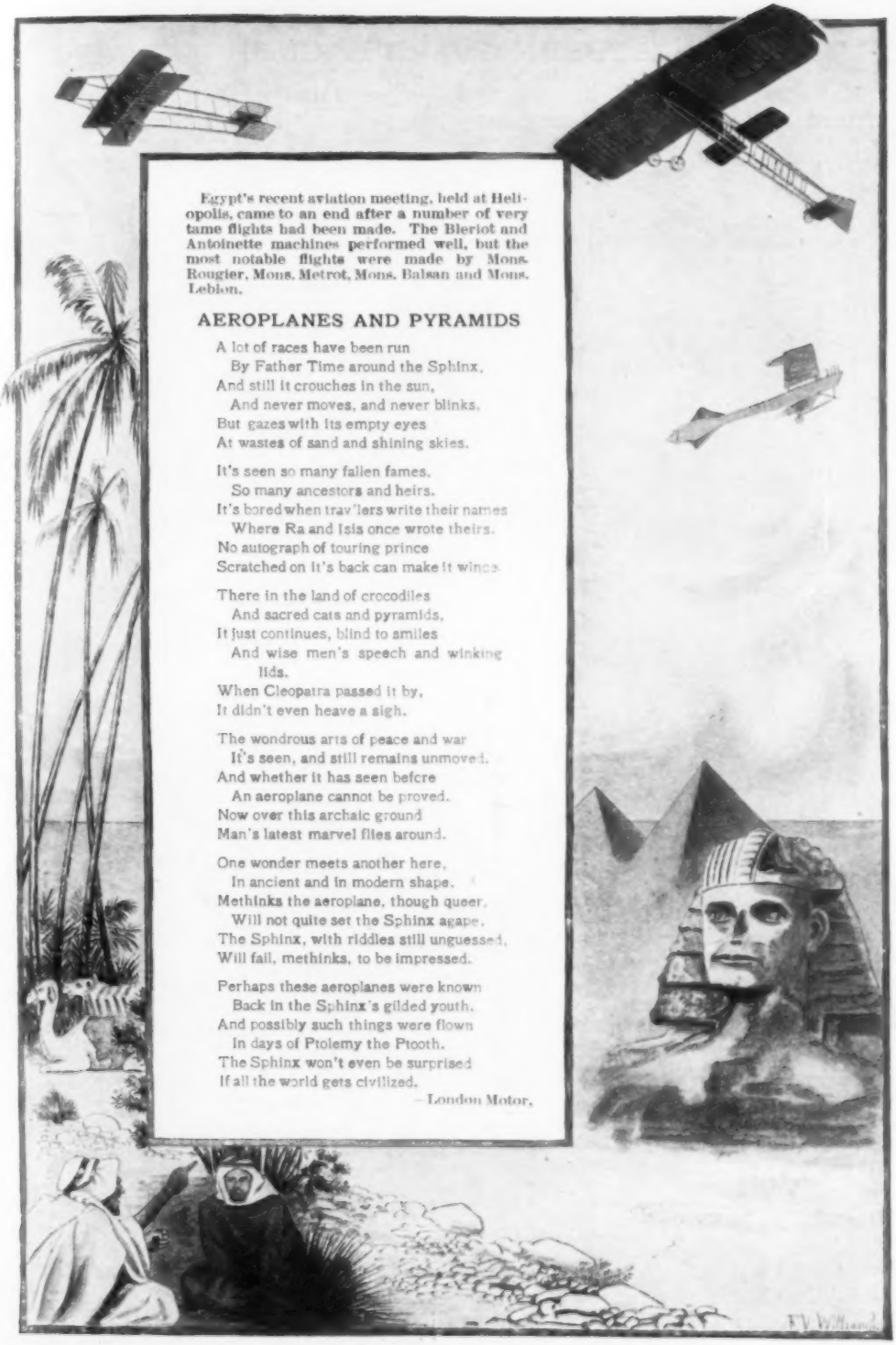
GLASGOW TO HAVE LARGEST DRYDOCK

The port of Glasgow, Scotland, is to build a drydock that will be the largest in the world, having a length of 1,020 ft., an entrance width of 100 ft., and a depth at average high water of 36 ft. It is to be built in two divisions, the inner end being 420 ft. in length, and the outer 600 ft. Constructed in this way, the whole dock will be available for the accommodation of huge battleships and ocean liners, or, when the vessels to be handled are less than 600 ft. and 400 ft., it can be converted into two separate docks.

The three largest drydocks of the kind now in use are the two 930-ft. and the 925-ft. drydocks at Liverpool.

¶Completing the construction of a row of houses at the extreme upper end of New York city, a contractor recently discovered that the rear of the building was in Yonkers. Both cities require the erection of fire escapes. To put them on the front would mar the appearance of the houses. The contractor is puzzling over the situation.

¶At a recent trial at St. Paul, Minn., physicians testified that fright, when her waist caught in a shafting, so affected a girl's nervous system, that she became permanently bald-headed.



Egypt's recent aviation meeting, held at Heliopolis, came to an end after a number of very tame flights had been made. The Bleriot and Antoinette machines performed well, but the most notable flights were made by Mons. Rougier, Mons. Metrot, Mons. Balsan and Mons. Leblon.

AEROPLANES AND PYRAMIDS

A lot of races have been run
  By Father Time around the Sphinx,
And still it crouches in the sun,
  And never moves, and never blinks,
But gazes with its empty eyes
At wastes of sand and shining skies.

It's seen so many fallen fames,
  So many ancestors and heirs.
It's bored when trav'lers write their names
  Where Ra and Isis once wrote theirs.
No autograph of touring prince
Scratched on it's back can make it wince.

There in the land of crocodiles
  And sacred cats and pyramids,
It just continues, blind to smiles
  And wise men's speech and winking lids.
When Cleopatra passed it by,
It didn't even heave a sigh.

The wondrous arts of peace and war
  It's seen, and still remains unmoved.
And whether it has seen befcre
  An aeroplane cannot be proved.
Now over this archaic ground
Man's latest marvel flies around.

One wonder meets another here,
  In ancient and in modern shape.
Methinks the aeroplane, though queer,
  Will not quite set the Sphinx agape.
The Sphinx, with riddles still unguessed,
Will fail, methinks, to be impressed.

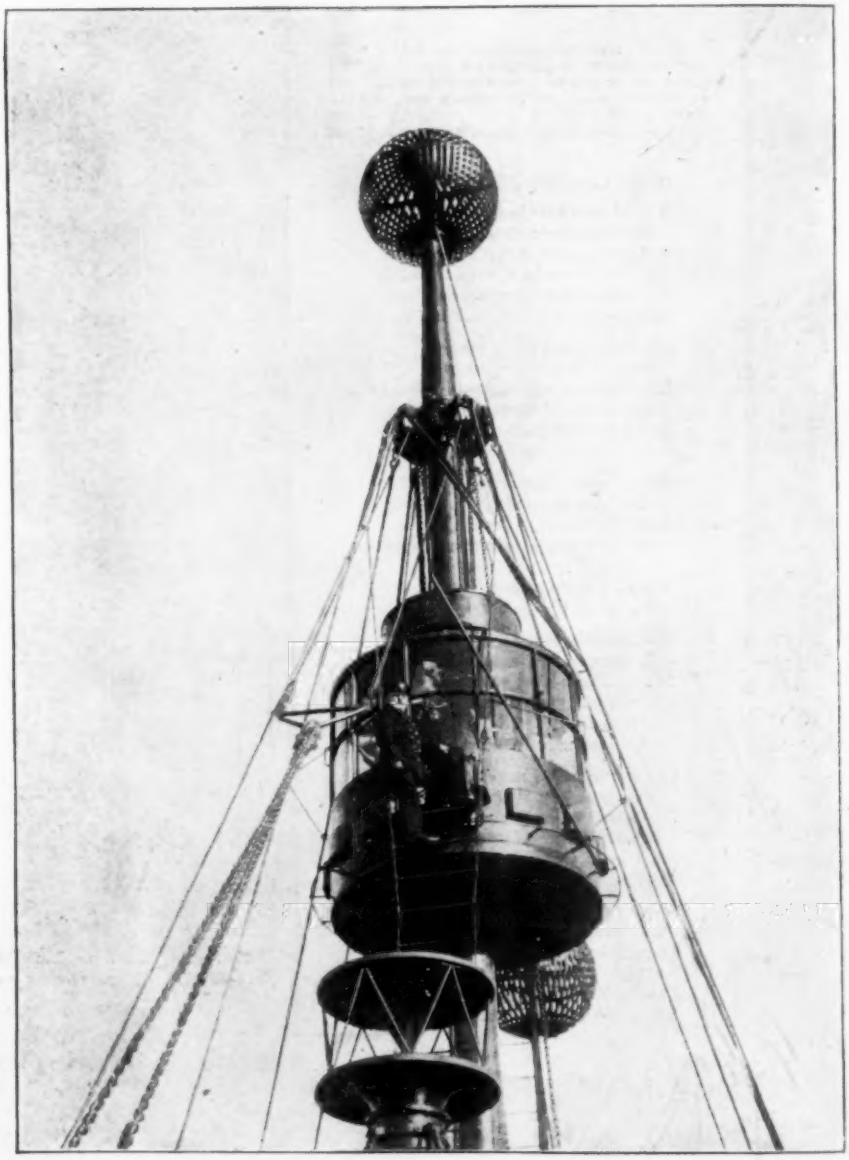
Perhaps these aeroplanes were known
  Back in the Sphinx's gilded youth,
And possibly such things were flown
  In days of Ptolemy the Ptooth.
The Sphinx won't even be surprised
If all the world gets civilized.

—London Motor.

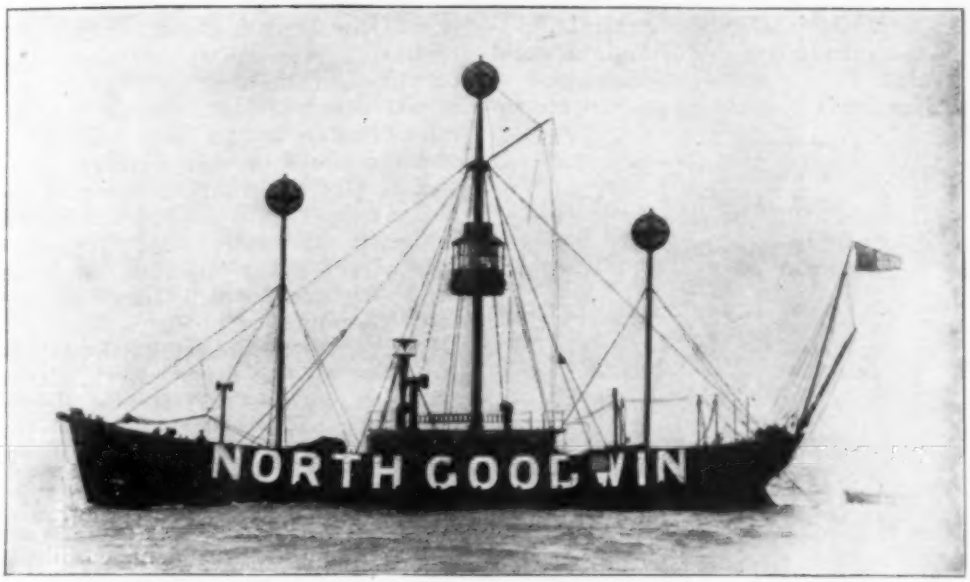
TRINITY BRETHREN GUARD ENGLISH MARINERS

No coast is better lighted and marked for the protection of the mariner than England's shore line, and no nation can boast of a more perfect organization than the Trinity Brethren, in whose hands this important trust is placed.

The Trinity House organization is an old one. There are houses at Deptford, the Cinque Ports, Hull, Newcastle-on-Tyne, and Leith. The most important is the corporation of the Trinity House of Deptford, founded in 1514 by Henry VIII. This house has

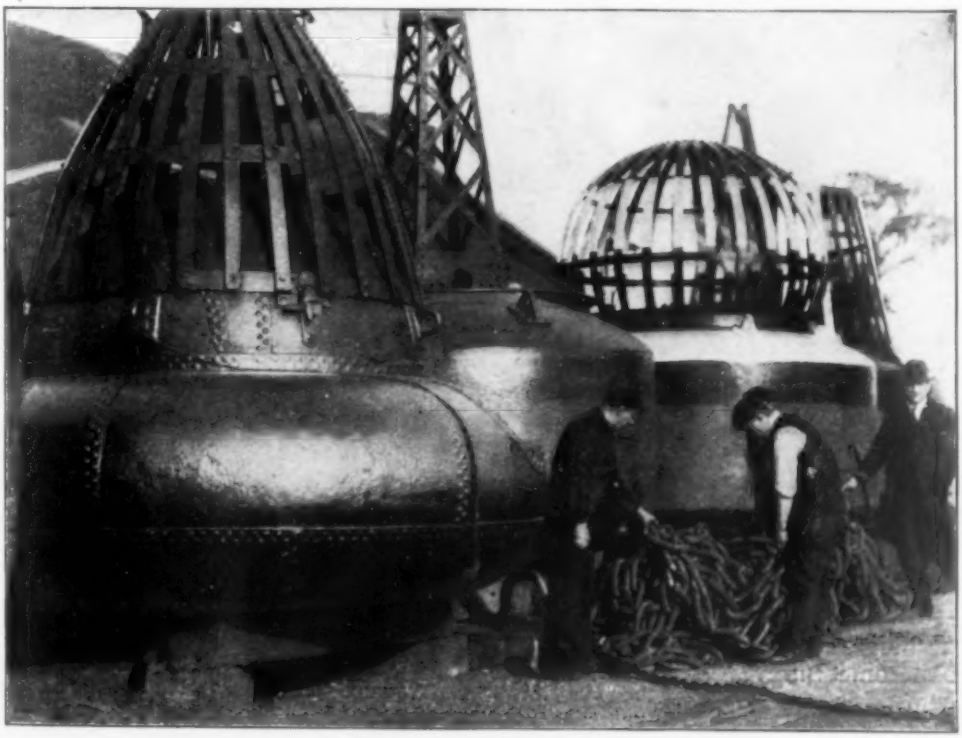


Officer Going Aloft to Inspect Lanterns on Lightships



One of the Trinity House Lightships

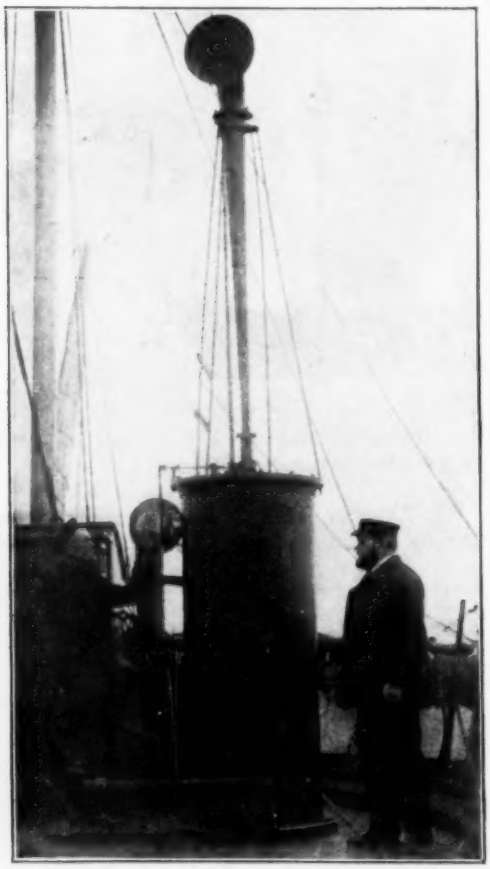
jurisdiction over pilotage between Orfordness and the Isle of Wight, in the Thames, and in all other districts where there is no other pilotage au-



A Few of the Gas and Bell Buoys

thority. It is also the general lighthouse authority for England and Wales.

Hundreds of men spend their entire



Operating the Compressed Air Fog Horn

lives in the service, sometimes isolated for weeks on lightships and lighthouses.

The placing of buoys to mark dangerous spots on the coast is one of the duties of the Trinity Brethren.

SEEING THEMSELVES ACT

The moving picture machine as a means of providing an opportunity for the players in the cast of "The Wolf" to become the audience, and watch themselves act was conceived by the actor, Andrew Robson. He called a rehearsal, arranged for an expert from one of the large film-making concerns to be present with the necessary apparatus, and the three acts were played through with as much attention to detail as if there were a large audience.

After the film was developed the members of the company were assembled at the theater to see themselves act, with the request that they make note of any stage business, facial expressions, etc., which they thought could be improved upon.

"As a result," said one of the actors, "we were able to carry out the desire expressed by the poet Robert Burns, 'O wad some pow'r the giftie gie us to see oursels as ithers see us.'"

A PISTOL FOR PAINTING

A fountain air brush, shaped like a pistol, and designed for either the fine work of an artist or for spraying (painting) large surfaces, has been placed on the market. The paint is contained in the holder above the barrel, and the compressed air, conveyed by a tube, passes through the handle of the curious gun into the barrel, where it picks up the paint and sprays it onto the surface being painted.

The machine is made in various sizes, ranging from the fine needle-point apparatus for artists' work to the sizes

Pistol Air Brush for Painters

used for painting vehicle bodies and like tasks. It is also used to some extent in painting tin and metal ware.

A DRESS SHIELD FOR VIOLETS

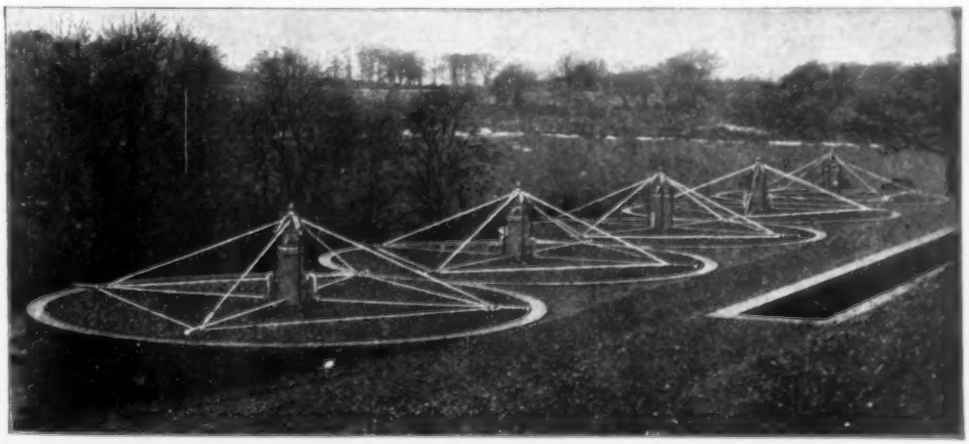
A Chicago florist has hit upon a clever idea for arranging violets in corsage bunches. The usual method of making up bunches of violets consists of arranging the flowers in round bunches of different sizes, wrapping the stems in violet colored tinfoil, and attaching a ribbon or tasseled cord of the same color. The Chicago florist arranges the violets against a shield, as shown in the illustration. At the top of the shield, and just peeping over the flowers is a fringe of lace. The shield, in addition to adding to the appearance of the violets, prevents the delicate fabrics of expensive gowns from being soiled by moisture from the flowers or by their crushing.

Front and Back Views of the Violet Shield

SEWAGE SPRINKLED OVER FILTER BEDS

A method of sprinkling sewage over filter beds has been adopted in some parts of England where there are no rivers or streams of sufficient size for its disposal in the ordinary way. The plant shown is at Bodmin, in Cornwall, and consists of five circular filter beds 50 ft. in diameter, each one of which is provided with a set of patent revolving sprinklers. The sewage flows from the sedimentation tanks into two supply chambers, from which it is discharged to the sprinklers by low draught coupled syphons and distributed evenly by the four arms of the sprinklers over the filter beds. The sewage-laden water percolates through the filter beds, from which it escapes into circulating pipes. When the filter beds become clogged with sewage the filler is removed and more is provided.

The sprinkling machines have no joints to leak, and are practically frictionless, there being no bearings in contact with the sewage and but little chance of clogging.

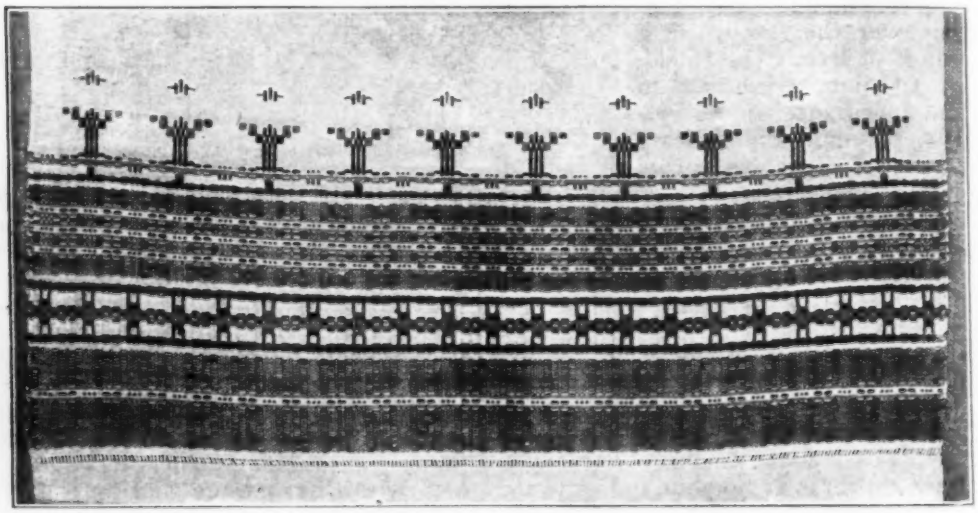


Filter Beds at Bodmin, England

BLIND WORKERS WEAVE ORIGINAL DESIGNS

Blind designers? Impossible, one would be tempted to say, until he had seen the handiwork of pupils of the Cambridge Art Fabric shop, where blind girls are working under the direction of the Massachusetts commission for the blind.

The designs made by the totally or partially blind women at this place are remarkable, showing not only a comprehension of the principles of the art as gathered from their instructors, but originality as well.



Designed by Sightless Worker

To understand how a blind person can create and develop an artistic design, it is necessary to know first how she can weave at all. The looms at the Cambridge shop are modeled after those of our grandmothers, only smaller in size. The plain weaving, or body of the goods, is made very simply. By dèpressing certain pedals every other thread of the warp is lifted and the shuttle is thrown through by hand with no more difficulty for the blind than for the seeing.

To reproduce a design another set of pedals is depressed and the warp threads are raised in definitely distinguishable groups, as characteristic to touch as to sight. A blind weaver can find any one of the six or more threads composing the group; thus she can easily locate any one of the seven or eight hundred threads which make up the width of the material she is weaving.

Having found the required warp threads it is a simple matter to insert the colored yarn or silk, which will make one row of the required spot. If this was continued for several rows of the woof or filling, the spot regularly increasing in size by two or more threads, it is easy to see that a figure would be formed the shape of a triangle. In the same way an irregular figure or series of figures can be built up as the cloth is woven. The effect of the finished article is that of needle work. In embroidery, however, the figure is made upon a fabric, while in the hand-woven stuffs the design is woven in as the cloth is made. The separation of the warp threads into groups, as described, makes it possible for the blind to locate the exact position at which the colored thread should be introduced into the fabric. Similar work with a needle would be impossible for a blind

person. A blind weaver quickly commits to memory simple designs which are dictated to her. Of course it is impossible for her to select colors, but the workers often suggest combinations which they think would be interesting. The various colors selected for any given design are definitely named and placed where they will be easily accessible and readily distinguishable because of their location or texture.

MUCOUS DISEASE CAUSED BY SMOKING AUTOS

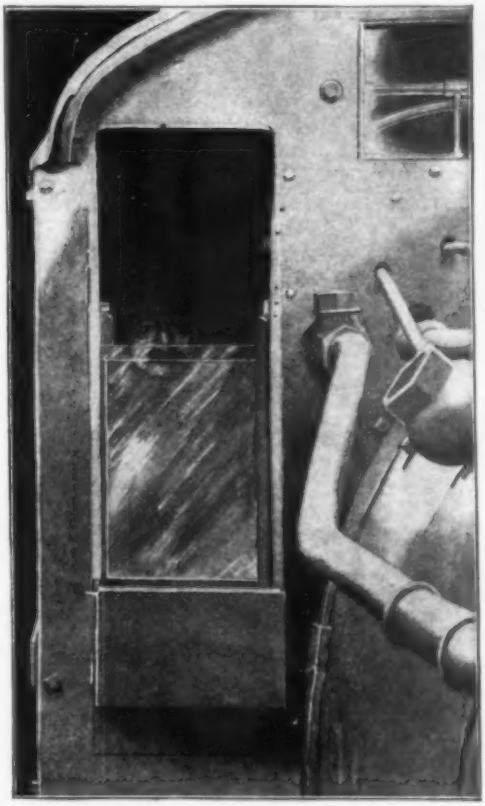
According to a New York physician, it is absolutely unsafe for a person with any affliction of the nose, throat or lungs, to ride through the streets of a city behind a smoking automobile, the result being a disease given the name of "motor rhinitis." It is similar to hay fever, being an inflammation of the mucous membranes of the head and throat, caused by inhaling the fumes of gasoline and the smoke from burnt lubricating oil.

STORM GUARD FOR LOCOMOTIVE ENGINEERS

Learning from experience the dangers that beset the engineer of a locomotive when, in a storm, he is unable to see the track ahead through the front window of his cab, a Dunkirk, N. Y., man has invented a storm guard which he claims is a solution of the problem.

There is no work more exacting than that of the man at the throttle of the steam locomotive. On his clear vision often depends the safety of hundreds of lives. At times it is impossible for human eyes to see ahead on account of the weather. The illustration shows an engineer seated in the engine cab, looking out through an open space. By the arrangement of the device, he is enabled to look ahead without being subjected to a swift current of air and smoke. Neither can cinders, rain or snow be driven into his face.

The principal part of the device consists of the regular glass window of the cab and another pane of glass, somewhat shorter, about 6 in. in front of it.

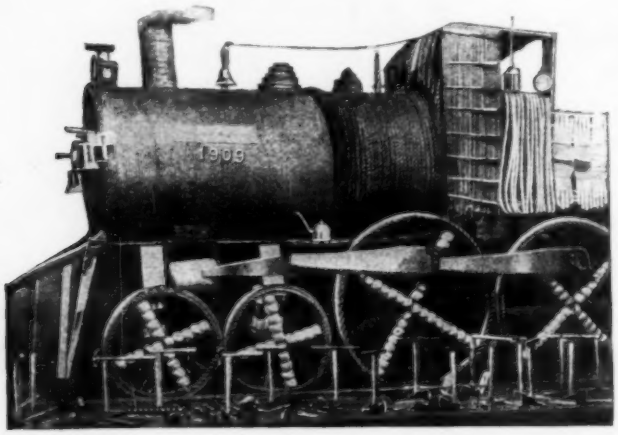


A Comfort for the Man at the Throttle

The sides are joined together and the bottom is open. A deflector, set at an angle, is placed over the opening at the top of the outer glass, the lower end protruding between the panes of glass. In service, wind, rain, snow, hail, dirt, or objects of any kind, in the air, strike the deflector and are thrown downward between the panes of glass. When the engine is travelling at a good speed not only is there a current of air downward from the deflector, but there is a slight draft out of the cab and down through the panes. For extreme weather conditions there is a small hinged window which comes down and joins the inner pane, closing the opening. Condensation on the glass is prevented by the current which rushes downward from the deflector.

AEROPLANE USED FOR PHOTOGRAPHIC PURPOSES ONLY

For several years the automobile has been an attraction of street-booth photograph galleries in which people can have their photographs taken while seated in a dummy motor car that appears like the real thing. In the same manner the coming of the aeroplane is resulting in photograph galleries in which dummy aeroplanes are the leading scenic feature.



Intended to Pull Nothing But Trade

The first instance in which the aeroplane becomes the accomplice of the photographer in this country is at Los Angeles, Cal. The aeroplane in use is the invention of a Scotch resident of Los Angeles, and, although it was unable to rise from the ground, it has proven a great success financially. Every person photographed in it pays 50 cents.

LOCOMOTIVE OF HARDWARE STOCK

A clever representation of a railroad locomotive was made for window decoration recently by the use of goods taken from the stock of a Johnstown, Pa., hardware store. Nothing that was used in making the locomotive was secured outside the store.

The boiler was made of rope. Rules were used to form the front end. The two side lights were blow torches and the headlight was a scale. A coiled wire clothes line was the smokestack, the steam dome and sand box were made of emery wheels, a beer spigot served as the whistle, and two squares were called upon to act as hangers for the bell. The fire room was made of white chain, on which was hung chisels, rubber hose, gloves, oil cans and alarm clocks. Two wood buck saws made the cowcatcher.

The wheels were made of tiles and the spokes consisted of files. The shaft was formed with saws and the cylinder was merely a ball of rope. Trowels represented oil boxes and levels served as rails.

Non-Flying Aeroplane That Proved Successful

STATE CAPITOL SOLD FOR $3,315

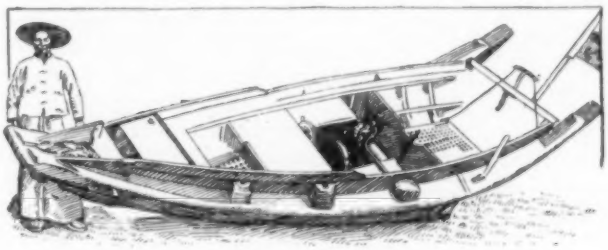
The building shown in this illustration cost $240,000, and was used for many years as the capitol of California. But at a recent auction sale it was sold to a wrecking company for $3,315. The ground upon which it stood in Sacramento is to be used for new county buildings.

The structure, considered an elegant one in its time, was built in 1855 by the county of Sacramento, and was leased to the state from the time of its completion to 1869, at an annual rental of $12,000.

California State House to Be Demolished

A CAVE THAT BREATHES

A curious crevice has been found in a cave in lava formation on a high piece of tableland, near Prescott, Arizona, which is said to breathe, because there is a constant current of air issuing from it or being drawn into it. The air is exhaled from it most of the time, but at intervals, which last several minutes each time, the direction of air is reversed, causing a strong suction.



Sampan Equipped with Gasoline Engine

The crevice is 3 in. wide and several feet long, and it is not improbable that the draught is caused by a connection with an opening somewhere else. A waterfall or rapidly moving stream of water within the earth might also, it is said, have the effect of expelling followed by intaking of air.

MOTOR-DRIVEN CHINESE SAMPAN

That the small marine gasoline engine is adaptable to the ordinary Chinese sampan, a rough but hardy little boat built on somewhat the same lines as the American dory, has been proven by an experiment at Amoy, China. The sampan used in the experiment was about 19 ft. long, 5 ft. 3 in. wide, and drew about 15 in. of water. In its center was placed a 3½-hp., single-cylinder gasoline engine of a simple type. Carrying seven passengers, the crude-looking boat was able to make a speed of about seven miles an hour.

The number of sampans in the Amoy district is about 2,000, and J. H. Arnold, U. S. consul at that city, believes a simply constructed, efficient and cheap motor, preferably using kerosene instead of gasoline, would find a growing market for such boats. Gasoline is about twice as expensive as kerosene in China.

¶A record catch was made last month at Palm Beach, Fla., when a visitor landed a 500-lb. loggerhead turtle with a rod and line.

TUNGSTEN—A REMARKABLE METAL

By

Guy Elliott Mitchell

THE use of tungsten as an alloy for fine tool steel and as a filament for incandescent electric lamps, has made possible on the one hand the production of steel tools possessing an efficiency never dreamed of by the most

A Tungsten Lamp—Rival of the Sun

expert steel forgers of a generation or so ago, and again, has brought to civilization an artificial illuminant rivaling in purity and brilliancy the rays of the sun.

Tungsten is not a recent find; it was discovered in Finland over a hundred years ago, but until the past few years it was a rare, high-priced, and almost unused metal. Recent discoveries of large ore bodies have brought it within the range of general usefulness and its remarkable properties have constituted it a prime factor in revolutionizing several industries.

The addition of a small proportion of tungsten imparts to steel the property of holding its temper at high degrees of temperature. When lathe tools are made from tungsten steel the lathes may be speeded up until the chips leaving the tool which is being shaped are so hot that they turn blue.

In an address before the Iron and Steel Institute, Manchester, England, C. A. Edwards stated that a steel containing .68 per cent of carbon, 2.01 per cent of chromium and 19.37 per cent of tungsten was the hardest steel, to his knowledge, on record. Only corundum, the topaz and the diamond are harder materials.

Intense heat, in the ordinary conception, has no effect upon tungsten. Its melting point is about 3080 degrees centigrade or over 5500 degrees Fahrenheit. It is a very heavy metal—*tungsten* means literally *heavy stone*—and has a specific gravity of 19.26, that is, it weighs 19.26 times as much as an equal volume of water.

While the use of tungsten as an alloy for tool steel creates a market for extensive mining of the metal, it is in electric lighting that it holds the field against all rivals. Its great resistance to heat makes it unsurpassed for use as a filament in incandescent electric lamps, and such lamps are rapidly coming into common use. It is the most perfect of artificial lights. The one great drawback to the use of the lamps is that the filament is brittle and the loss in shipment is large. The life of the tungsten-filament lamp is, however, fully twice that of a carbon lamp, and it can be used on either alternating or direct current. As thousands of filaments can be made from a pound of tungsten, the market for tungsten ores for this use is very small and the supply can never be exhausted.

Tantalum, another remarkable metal, recently promised to revolutionize electric incandescent lighting, by displacing the ordinary carbon filaments. All attempts to make metal filaments had heretofore failed because they melted before they could be raised to incandescence. The fusing point of tantalum is very high and it was found that lamps

made from its filaments were successful, giving a beautiful white light and saving more than a third of the current consumed on the carbon lamps. But this really big discovery was hardly made when came the news that tungsten had been successfully utilized in electric lamps at even a greater economy and with better results than tantalum. So, like the comet of a season, tantalum astonished the illuminating world for a day and sank into comparative obscurity the next. While the new tungsten lamps cost about double the carbon lamps, the saving in electric current far outweighs the difference.

The ordinary, now old-fashioned, incandescent lamp consumes 3.8 watts of electricity per candlepower. The tungsten lamp consumes only 1.2 watts or less than a third.

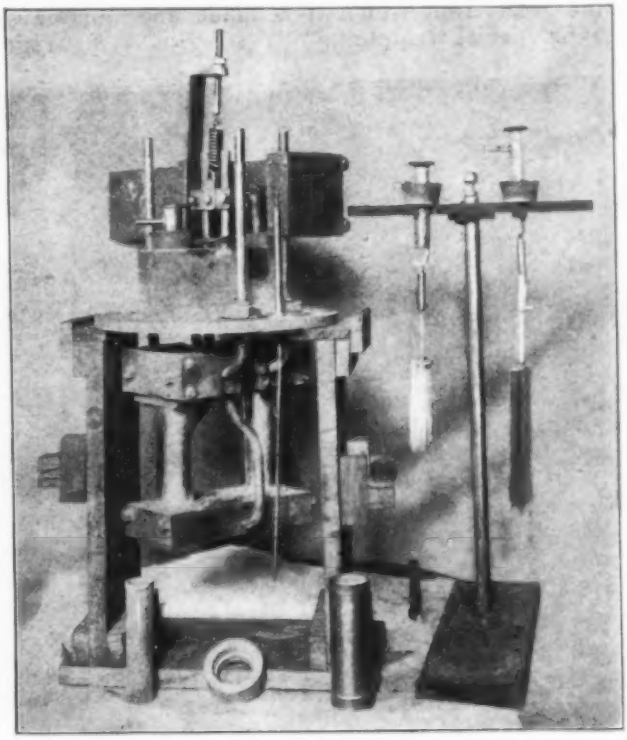
Tungsten light is very nearly pure white—true sunlight. It is the first artificial illuminant by which all colors can be distinguished. Artificial lights in which the yellow, violet, or red rays predominate cannot be used to match colors. Under the clear white light of the tungsten lamps violet is not blue; pink is not red; and blue is not black as when looked at under other artificial light. The most delicate tints show clear and true as in daylight.

Tungsten is also used in the manufacture of small crucibles for use in the electric furnace, where great heat resisting properties are desired.

Large quantities of sodium tungstate are manufactured, for use in fireproofing cloth for curtains, draperies, etc., and of less importance, when silks are dyed, tungsten salts, owing to their high specific gravity, are introduced to give more apparent weight to the fabric.

Tungsten is of plutonic origin, that is, it was forced up from the earth's bowels, millions of years ago, along with other igneous material and is now found in comparatively small deposits in quartz veins, associated with other of the rarer and precious metals. The supply is believed to be sufficient to meet the needs of industry for an indefinite period.

Last year the production was 1,958 tons, valued at $746,130. Of this Boulder county, Colorado, produced 1,401 tons. However, the tungsten development in the United States has been of recent origin, only 46 tons being mined in 1900. We are now by far the largest producers of all countries. In 1907 the world's output was 6,062 tons.



Electric Furnace for Reducing Tungsten

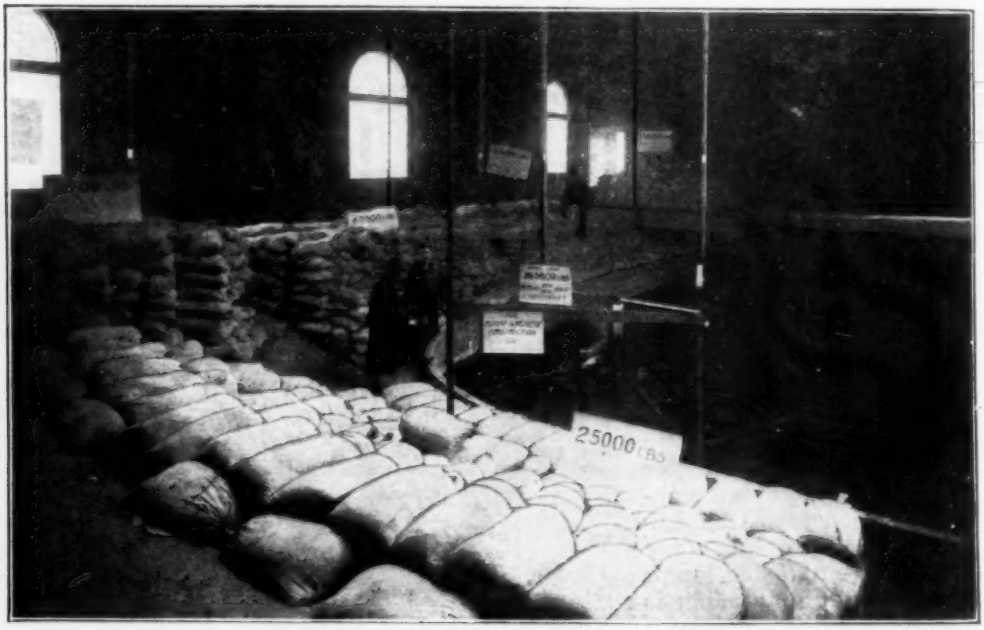
A curious error has gained credence based on frequently published statements that most of the tungsten mined was used in making armor plate.

Mr. Frank L. Hess, of the United

States geological survey, states that tungsten is not now, and never has been used in the manufacture of armor plate in this country, nor in other countries, though it has probably been used in experimental armor plates. One of the greatest essentials of armor plate is its ability to resist shock, and this property is not imparted to steel by tungsten. Most armor plate depends for its shock-resisting properties upon the addition of nickel and chromium to the steel from which it is made and upon special treatment.

a few months ago, and it was thought that in the course of time telephone companies would take up the idea. It has just been announced, however, that a manufacturer of automobile accessories is about to add such instruments to his output.

The autoist, when his car goes out of commission in an isolated country district, will be able, with the aid of this apparatus, to join a series of thin rods together, extend it upward to a telephone wire, and make connection with a garage to summon assistance.



Ferro-Concrete Balcony Tested by

PORTABLE TELEPHONE OUTFITS FOR ISOLATED AUTOISTS

The rapidity with which what seem like extremely advanced suggestions for improvements in mechanical or electrical instruments are taken up is shown in the enterprise of a firm which is now preparing to manufacture portable magneto telephones with fishpole attachments for making connections with telephone lines in country districts.

This suggestion was first heard but

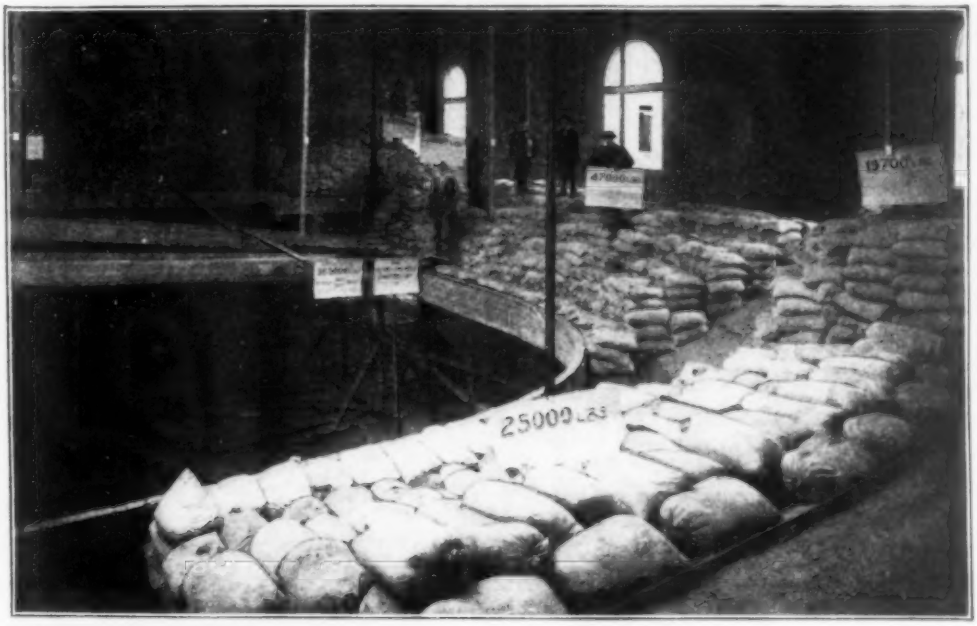
TESTING FERRO-CONCRETE BALCONY

This photograph, which at first sight would give the impression of a warehouse interior, shows, in reality, the novel method adopted to test the reinforced concrete balcony of the Woodward high school, Cincinnati. The bags piled up all around it have a combined weight of 365,600 lb.

The test was undertaken to assure the public of Cincinnati that the balcony, the first of its kind in that part of the country, was absolutely safe.

There are no columns under it, but the outer edges rest on brick walls and the inner parts are supported by ten 2-in. steel rods, suspended from massive concrete roof beams. These beams run in two directions, spanning 70 ft. one way and 80 ft. the other.

Although the load remained on the balcony 24 hours there was no apparent deflection of the roof beams. The greatest deflection under the balcony was 11/64 of an inch, and was at the inner edge. The greatest elongation of the steel rods was 1/16 in.



365,600 Lb. of Cement in Bags

NATURAL GAS PIPED 95 MILES TO FORT WORTH, TEXAS

Piped from a source considered by experts to be ample to supply the needs of the city for many years, Fort Worth, Texas, is now being furnished with natural gas from the Henrietta fields, 95 miles away.

The quality of the gas is declared to be excellent. The wells are large, and the pressure is strong enough to carry it several times the distance between the source and the city. There are fields in Pennsylvania, supplying several communities, that have been drawn upon for 25 years, and show no signs of losing strength. Basing their judgment on this fact and the superior rock pressure of the Henrietta fields, the engineers in charge say Fort Worth will not have to worry about other sources of supply for many years.

THE USES OF SEAWEED

The uses of seaweed have become so numerous that its harvesting is now an industry of some importance. The annual export of seaweed from San Francisco to China is valued at nearly $100,000, while gatherers of the weed on the Canadian Atlantic coast are now shipping to Boston.

From seaweed, when reduced to ashes, are gained many preparations in use today. Some of these are iodine, bromine, hydriodic acid, iodides of sodium, mercury, potassium, magnesium, and calcium. From it are also extracted coloring matters. Dried seaweed finds a use as stuffing for mattresses and pillows, for covering flasks, and as packing for glass.

ARTISTIC CEMENT BUILDINGS—No. 7, Residence of J. J. Chapman, Barrytown-on-Hudson

THE MENACE OF THE MATCH

By

Alfred Stumpe

THE eighty million people in America use as many matches as the eight hundred million in the rest of the world, according to the statistics of the National Fire Protection Association. This supports the contention that we are the most wasteful and extravagant people in the world.

If one is in need of a match anywhere in continental Europe he must seek it in its proper place. Matches are not wasted in the Old World. Centuries of training in thrift and economy make the continental people conscious of the fact that matches cost money. Where does one find them in America? They are in practically every room, in almost every building, public and private. The American breathes imprecations if he cannot, at any moment of the day or night, reach out his hand and find a match. They repose in the pockets or linings of every old coat and waistcoat; they are scattered about desk and bureau drawers; they are found in every accumulation of rubbish wherever it may be; they are so carelessly and recklessly thrown about that rats and mice have adopted them as a standard article for nest building, certain always of an available supply.

Unfortunately the burden of this extravagance is not confined to the cost of the matches themselves. This little article, unknown until 1832, while perhaps one of the most important factors in our civilization, has been doing its best ever since its creation to destroy the world it was designed to serve. The assistance given it as an instrument of destruction by the carelessness of the American people is a matter of amazement to continental countries.

The average per capita property loss by fire in Central, Western and Southern Europe is 33 cents. In the United States the average is $3.02. The reason for this astonishing difference is obvious the moment conditions are scrutinized. A continual shower of unextinguished matches is falling into waste baskets, rubbish heaps, upon the rugs of clubs, hotels, dwellings and offices, thrown by careless smokers. Men reputed to be good fathers have been known to light cigars in the hallway of their homes, throw the match in the general direction of a cuspidor and go out; to return in half an hour to see firemen rescuing their children from second-story windows.

In Massachusetts, in 1907, there were 5,794 fires, 1,230 of which, entailing a loss of $658,346, were known to have been caused by matches.

The fire marshal of Wisconsin says, that during a period of sixty days, twenty-five fires in his state, involving a property loss of $106,327, were traceable directly to the "parlor" match. In Ohio, another of the few states giving attention to needless fire waste, the fire marshal declares that match fires constitute a "continuous performance" at a cost of half a million dollars per year.

In one year of 446 fires from matches in this state, 122 were caused by children; 298 by the carelessness of adults, and 26 by rats and mice—also through carelessness of adults.

Thirty-six women and children were burned to death in Ohio through having their clothing fired by matches. Of these, who suffered death in this, its most horrible form, thirty were children playing with matches left carelessly within their reach, and six were women whose clothing took fire from flying match heads. Among these are not included five mothers who were themselves burned to death while trying to save the lives of their flaming children.

The number of persons burned to death in the United States each year by the parlor match is between eight and nine hundred, and the property loss

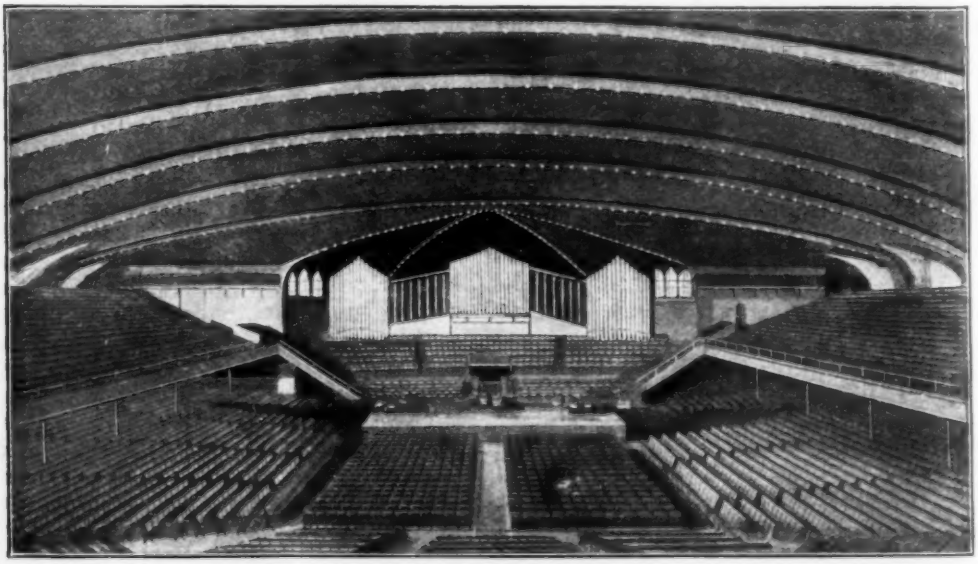
mounts into the millions. The "parlor" match is the common variety, which can be ignited upon any hard surface, as distinguished from the "safety" match, which cannot ordinarily be ignited except upon the box in which it is sold. The original "lucifer" match, which, when ignited, gives off the choking fumes of sulphur, is still used extensively in some sections of the country and is a safer match when handled carelessly than the larger headed parlor type.

Certain effort has been expended upon the parlor match to lessen its fire hazard. In some varieties the stick is chemically treated, so that a live coal will not remain when the flame is extinguished. In others, called "bird's-eye matches," only a small white point of phosphorus on the head can be ignited by friction. These improvements are good so far as they go, but vast quantities of the most hazardous type are found everywhere in the United States. Denmark and Switzerland prohibit the use of parlor matches, and other continental countries impose restrictions. It is in America only, where cheap wooden buildings abound, and where, therefore, restrictions are most vitally needed, that the parlor match is free to slay and burn.

It costs no more to make the safety match than it does to make the deadly variety, and it is ordinarily sold as cheaply. A modern matchmaking plant can turn out from four to seven millions of either kind in a day. It rests, therefore, with the people themselves, either to continue the present careless snapping of match heads upon bed covers, curtains, carpets, clothing and other inflammable materials, for which practice so frightful a price is paid in property and life; or to protect the common interests of humanity and the life of their households, by thoughtfully exercising care in ordering their match supply. It is almost wholly a matter of education.

CONCRETE USED IN ORGAN CONSTRUCTION

The great new organ in the auditorium at Ocean Grove, N. J., said to be the most wonderful organ in the world, is partially composed of concrete, and it is this radical departure in organ construction that is heid ac-

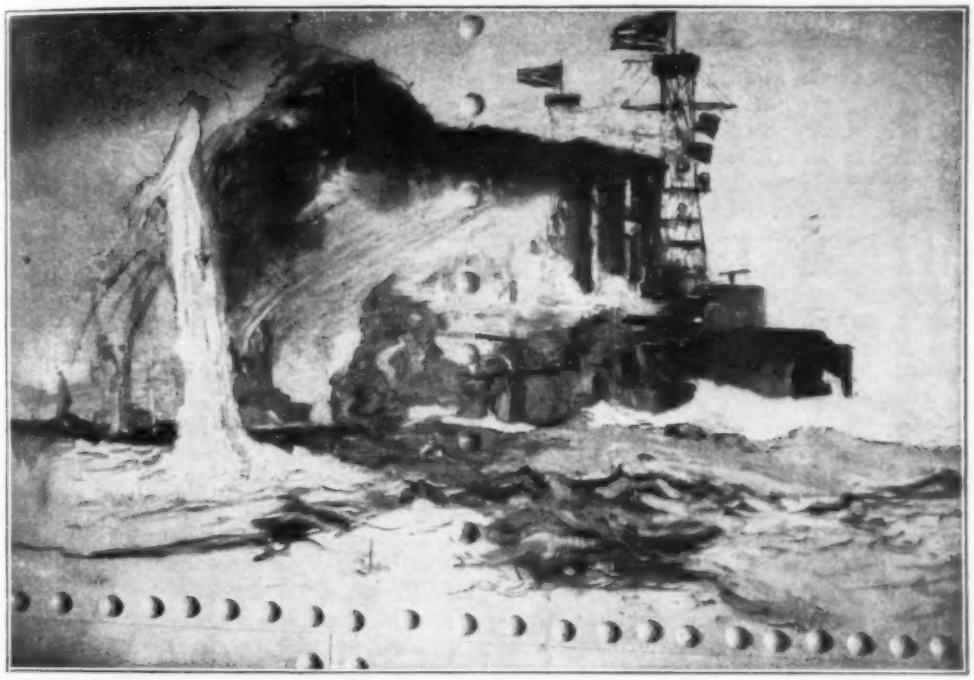


Concrete Organ at Ocean Grove, N. J. Courtesy Cement Age

countable for the fine tone of the instrument. Apart from the metal pipes, the ordinary organ is a delicate machine constructed mostly of wood, leather, and glue, and these materials are affected by every change of temperature. In the organ at Ocean Grove the wooden parts have to a great extent been replaced by concrete, and but little leather or glue is used.

Concrete construction was employed wherever possible. The chambers and passages for the compressed air, the four or five chambers for the pipes, and the larger of the pipes themselves are of concrete.

Aside from the concrete construction, the method of furnishing air to the organ is also novel. There are no bellows, regulators, nor moving wind reservoirs. Instead of relying upon the varying capacity of a collapsible reservoir, the air itself is compressed. Electric motors compress the air at a definite pressure into the concrete chambers, and the wind chests and pipes are in direct communication with these chambers. By this means a perfectly even supply of air is at all times available.



On the Wardroom Wall of the "New Jersey"

A SIX MILLION-DOLLAR PAINTING

Uncle Sam is the possessor of a unique painting that is probably the most costly in the world. It is painted on the wardroom wall of the battleship "New Jersey," and was executed while the ship was undergoing repairs at the Charlestown navy yard The painting represents a battle scene, several large sea fighters of the modern type, firing at the enemy as they pass in battle formation. The leading ship is discharging a broadside from her heavy guns, while just off her bow is a great geyser of water thrown up by a shell from the enemy.

Henry Reuterdahl, the marine artist, executed the work. The "New Jersey" cost about six million dollars, and as the painting is now an integral part of the ship, this may be said to be the most valuable painting in the world.

TELEGRAPHONES REPORT POLYGLOT CONGRESS

During the recent International Technical Congress, held in Copenhagen, it was found difficult to secure stenographers who, in addition to being conversant with the different languages, had some technical knowledge. It was therefore decided to adopt the telegraphone, a new phase of the utilization of the telephone receiver.

The transmitters, mounted in front of the speakers, were connected to two telegraphones, installed in an adjoining room, says Telephony. Each of the spools of the telegraphones contained over half a mile of steel wire, and was capable of recording speech for ten minutes. The two instruments were working together, so that when the wire of the first machine was used up, the second machine was put in, recording until it was filled, when it was replaced by the first. Nearly 150 miles of wire were used.

Engineers who understood the languages and were familiar with the subjects, listened to the telegraphone, and then, omitting all unnecessary words, dictated the matter to stenographers. By pressing a button the instrument could be made to repeat whenever it was necessary.

HOW TO MAKE A MAGAZINE TABLE

This little magazine table will be found a very useful piece of furniture for the den or library. Its small size permits it to be set anywhere in a room without being in the way. Quarter-sawed oak should be used in its construction, and the following pieces will be needed.—

4 legs, 2 by 2 by 29 in., S 4 S.
4 end slats, ½ by 2 by 10 in., S 4 S.
1 shelf, 1 by 16 by 30 in., S 1 S.
1 top board, 1 by 18 by 36 in., S 1 S.

If you are convenient to a planing mill you can secure these pieces ready cut to length, squared and sanded. This will save you considerable labor.

The four legs are finished on all sides and chamfered at the bottom to prevent the corners from splitting. The mortises for the shelf should be cut 9 in. from the top of each leg, as shown in the sketch. Care should be taken to make these a perfect fit.

The shelf should be finished on the top side and the four edges, and the corners cut out to fit the mortises in the table legs. An enlarged view of this joint is shown in the sketch.

Magazine Table Completed

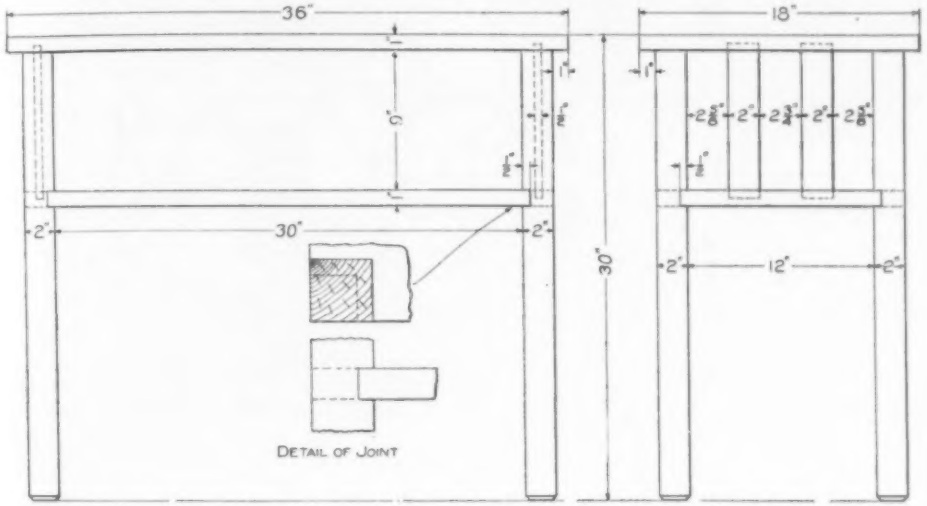
The top board may have to be made of two 9-in. boards, dovetailed and glued together. It should be finished on the top side and the edges. The edges can be beveled if desired. The board is fastened to the legs by means of screws through four small brass angles. These angles can be made or they can be purchased at any hardware store.

The top board and the shelf should be mortised at each end for the ½ by 2-in. slats. These slats should be finished on all sides.

The table is now ready to be assembled and glued together. The glue

should dry at least 24 hours before the clamps are removed.

After the glue is dry, carefully go over the entire table with fine sandpaper and remove all surplus glue and rough spots. It can now be finished in any one of the mission stains which are supplied by the trade for this purpose.



Details of Magazine Table Construction

PILE OF 13,000,000 CARTRIDGE SHELLS

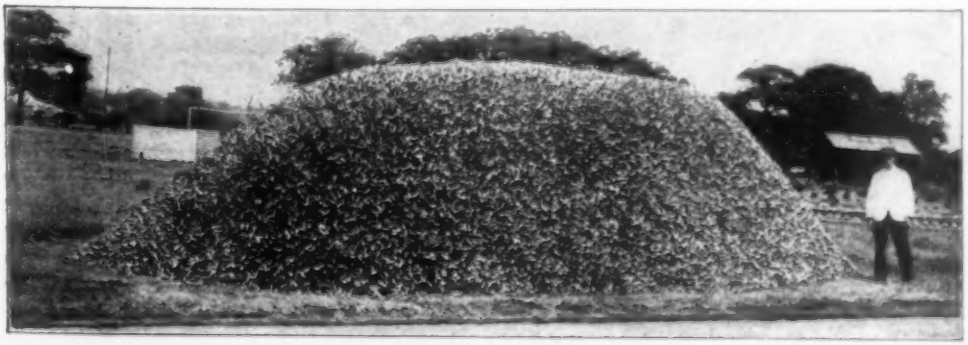
Thirteen million cartridge shells, the result of 11 years of shooting by the members of a gun club, have been gathered into a huge pile by one of the leading sporting organizations of England.

Eleven years ago one of the members conceived the idea of having the members save all their shells and deposit them on the pile. The shell bank is now the club's most prized possession.

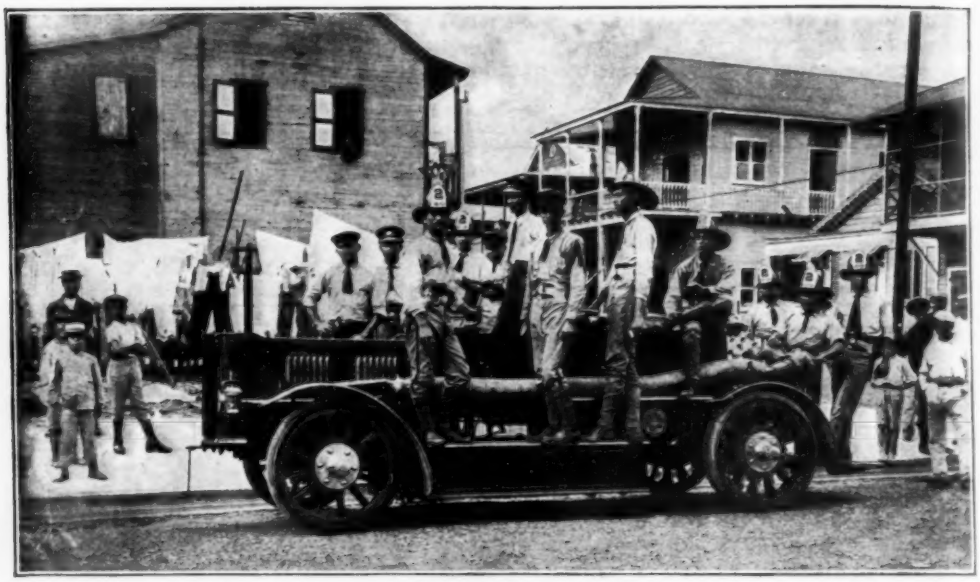
If a single man were to shoot one cartridge a second, day and night, it would take him about 25 years to discharge 13,000,000.

The club maintains a vigilant guard over its precious shell pile.

¶King Albert, the new monarch of Belgium, devotes two hours every day to the study of mechanical engineering. He drives his own automobile, and what is more, he can repair it when anything gets out of order.



Result of 11 Years' Shooting



Colon's Up-to-Date Fire Engine

AUTO FIRE ENGINE IN PANAMA

Panama, not to be outdone by other sections of the American continent, now possesses an up-to-date unit of fire-fighting apparatus in the auto fire engine recently added to the Colon fire department. The engine runs at a speed of 30 miles an hour, and will throw two streams to a height of 150 ft., which is more than sufficient for the work required in the district at present.

It is a curious fact that it is the outlying and newest cities of America, whether in the United States or Canada, that are the most rapidly being provided with motor-driven fire apparatus. Many of the younger cities of the Canadian Northwest have complete auto brigades.

BUILDING DRYDOCK OF CONCRETE BLOCKS

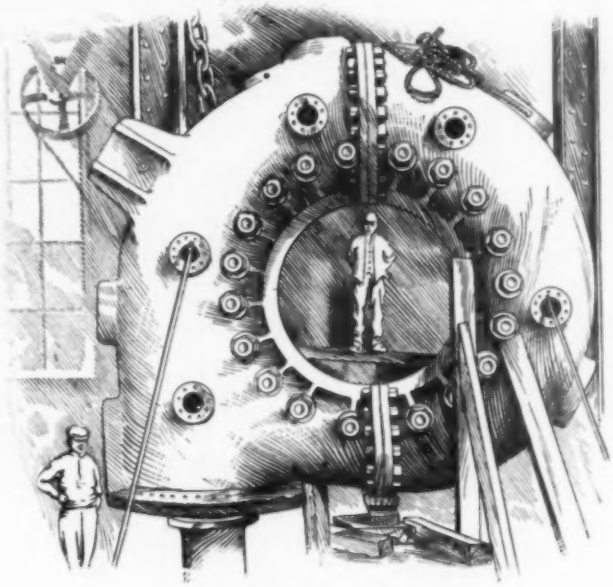
Sinking Huge Concrete Blocks

Concrete blocks of mammoth dimensions were used in the construction of the new 875-ft. drydock at Southampton, England, which, although 55 ft. shorter than the longest existing drydock, is to be the deepest in the world. The illustration shows one of the concrete blocks being placed in position in one of the walls. A diver is at work at the bottom. The vessel in service is a wooden craft, reconstructed for the purpose of placing the blocks.

MOST POWERFUL WATER TURBINE

The huge casing here illustrated is one of the four most powerful hydraulic turbines in the world, each of which is rated at 18,000 hp., when operating under a head of 225 ft. and at a speed of 400 revolutions per minute. They are installed in the power house of the Great Western Power Co., on the Feather river, at Oreville, Cal., and, combined, deliver over 70,000 mechanical horsepower to the electric generators they drive.

The turbines embody a number of unusual features, one of which is that the 525-ft. hydraulic head for which they were designed is considerably higher than is customary for the reaction type of wheel. It has only been within the last few years, according to the American Machinist, that reaction turbines have been applied to heads much over 300 ft., the impulse wheel having been used almost exclusively for heads above that value. Each of the turbines has a greater capacity by several thousand horsepower than any existing turbine. The highest powered wheels at Niagara Falls have but 13,500 hp., which is about 33 per cent less than the Great Western turbines. Also, the turbines at Niagara Falls are of the 2-runner design, while the turbine here illustrated has but one wheel or runner. Consequently the runners of the former develop only 6,750 hp. each, as compared to the 18,000 hp. of the latter.



Develops 18,000 Horsepower

ILLUMINATED TAXICAB DIALS IN BOSTON

The commissioner of weights and measures in Boston has demanded the illumination of the meter dials of all taxicabs, but his order is meeting with strenuous opposition, the taxicab companies maintaining that they cannot provide and maintain the required equipment at the present rate of charge. The manager of one of the large taxicab companies states that it will cost from $3,000 to $5,000 a year to comply with the lighting rule, as it will be necessary to wire the cabs, install lights and batteries, and maintain a large number of charging stations.

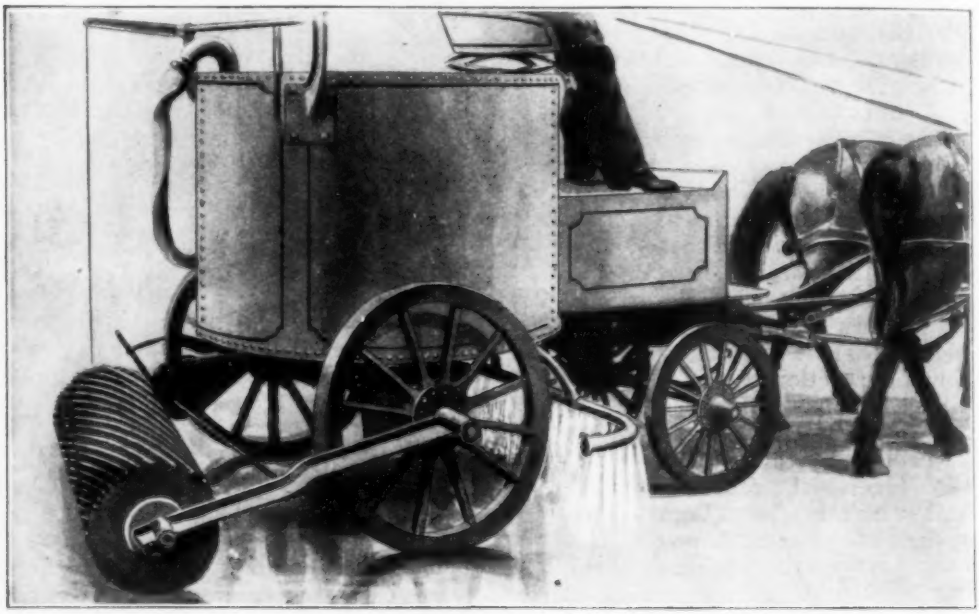
The large taxicab companies have for some time provided the drivers with pocket electric lights and require them to illuminate the dial at the end of a trip for the benefit of the passenger, and they believe that this is sufficient.

¶The plan of placing mail collection boxes on street cars is considered successful in Wilmington, Del., where it has been tried out for a year.

¶A recent tariff decision holds that a cut-glass stopper in a molded glass bottle makes the whole assessable as cut glass.

COMBINATION SPRINKLER AND SWEEPER

The street-cleaning vehicle shown in this illustration is one of San Francisco's combination sprinklers and sweepers. The water settles the dust, and the sweeper, which is dragged behind, not only brushes the dirt to the curbing, but pushes the water there, thoroughly drying the pavement so that there is no danger of horses slipping or automobiles skidding. The sweeper is of rubber, spirally arranged.



San Francisco Street-Cleaner

STABILITY INDICATOR FOR SHIPS

A mechanical stability indicator has been designed by which it becomes possible for the officers and crew of a cargo ship to tell exactly where to stow cargo with relation to stability, instead of leaving it to guesswork. The proper placing of cargo is, according to the Shipping World, a vital factor in the safety of a ship, and poorly apportioned cargoes may result in capsizing. The skill and labor expended by the shipbuilder upon the design and construction of cargo steamers are often rendered useless by carelessness in the distribution of the cargo.

The construction of the stability indicator is based upon the buoyancy, displacement, and other calculations of design. The balance consists of a beam, the length of which (usually from 2 to 3 ft.) is made in proportion to the depth of the ship concerned. At the bottom of the beam is a bar, on which weights can be suspended at any desired points, the centers of the cubic capacities of the different holds, coal bunkers, and ballast tanks, being indicated on the beam. The beam represents the ship in light condition and the weights represent cargo, coal, and water ballast.

TELEPHONES OVER 1,800 MILES

By use of a microphone instrument, invented in France, which raises the human voice two and one-third octaves, conversation was carried on successfully over a telephone circuit reaching from New York to Pittsburg and Chicago and return, a distance of 1,825

miles. The voice, it is said, came back from its long trip as clear as a bell.

The telephone instrument used in the test is but slightly different in appearance from those ordinarily used on standard lines, but the voice is received on a microphone. A special combination of drums raises it two and one-third octaves, and it is sent over the wire at that pitch. The waves, being very sharp and short, travel rapidly, and the receiver at the other end, through another combination of drums, reduces the vibration, so that the voice is heard in its normal speaking tones.

INSTRUMENT IMITATES CHIMING OF BELLS

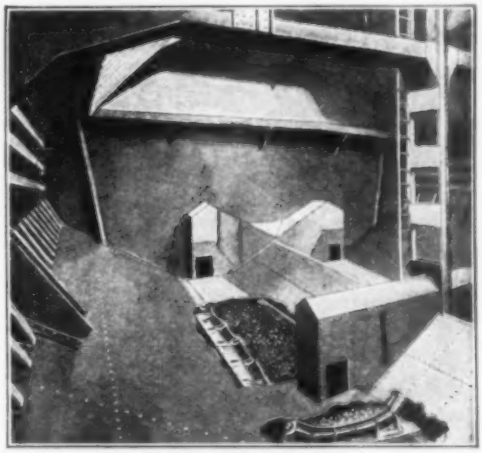
This unique instrument, called the "tympanophone," produces sounds like the chiming of bells, but although these sounds are quite distinct when the ear is pressed against the end of the instrument, they can not be heard by anyone else in the room, an advantage in some instances. Many persons would be thankful if their neighbor's piano or cornet possessed the same quality.

The "tympanophone" consists of a cylinder of wood, terminating in a sort of ear trumpet, and is provided with ten fragments of springs protruding from the wooden cylinder. When the trumpet end is placed against the ear, and the springs are struck with a wand, the chime-like sounds are produced. The end of the wand which strikes the springs is formed of rubber.

If more than one person wishes to listen at the same time, the trumpet end is placed on a table top, and the auditors apply their ears to the table in the same manner that a person places his ear to a rail to note the approach of a train still out of sight.

DISCHARGING COLLIERS BY BELT CONVEYORS

The bucket method of discharging coal vessels which has been in use so many years, is given a rude shock by a new system of belt-conveyor discharge, adopted in the construction of several new English colliers.



The Hold of the New Colliers Showing Protected Belt Conveyors

The vessels are provided with an inner bottom, which inclines toward the center. Protected by strong iron plates, a conveyor belt runs the entire length of the hold. Small hatches are provided in these plates, so that they may be opened at any part of hold and allow the coal to fall onto the belts. By means of the conveyor belt the cargo is thus carried out and discharged. By continuing the belts into large shoots the cargo may be discharged at an elevation of 40 ft. above the water. By this system 500 tons an hour may be unloaded, at a cost of two cents a ton.

The space between the two bottoms is large enough to permit men to reach any part of the conveyor belts to remedy any blocks that may occur and insure a continuous and uninterrupted delivery.

¶ The immense water-power resources of the Alps and Apennines is said to be the only hope for broad development of the manufacturing industries of Italy.

PULPIT USED AS PIGEON COTE

A discarded pulpit that has been inverted and turned into a pigeon cote

Curious Use for Old Pulpit

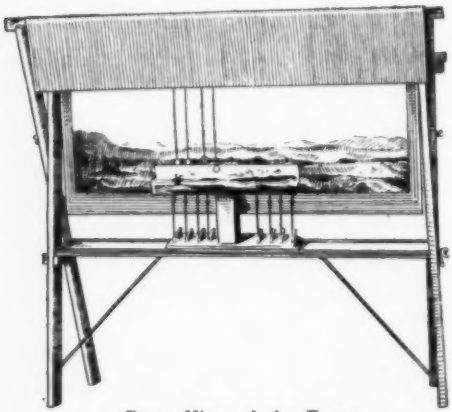
draws much attention in the little village of Mytton, in Lancashire, England. It stands among the trees and flowers near the old church where it once did sacred duty.

represented by a landscape on canvas, about 16 ft. from the operator, showing it as it would appear at a distance of about 5,400 yd., which is a little over three miles.

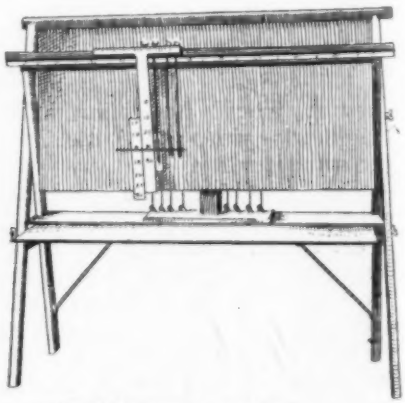
In front of the canvas are placed strips of cardboard showing intermediate distances, and the guns are represented by miniature artillery wagons. The effect of the fire is indicated by little balls connected with the guns. They hang on the ends of wires, and are so arranged as to drop onto the spot in the landscape where the projectile would burst, thus showing the accuracy of the aim. The wires are worked by a lever, and an artilleryman behind the canvas executes the orders of the commanding officer.

ROCK AS TRANSMITTER OF SOUND

That the earth and its rocks are natural sound as well as shock transmitters is shown in earthquakes, when a concussion deep in the earth, caused by grinding of rocks is carried by earthwaves to the surface thousands of feet



Front View of the Target



The Mechanism in the Rear

ARTILLERY PRACTICE INDOORS

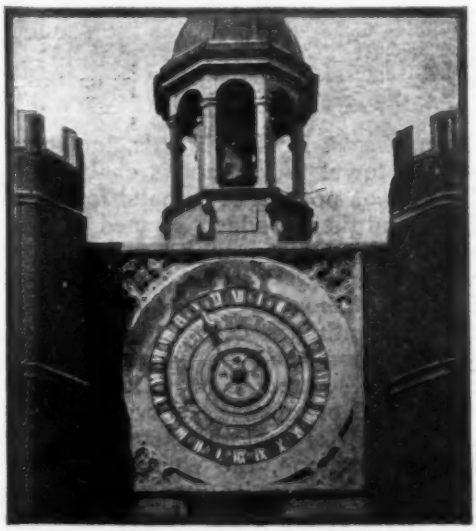
This ingenious apparatus is a target with which artillerymen may practice firing indoors. The country in which the firing is supposed to take place is

above, producing terrific sounds. In many instances of late, miners entombed in mines have communicated to their friends outside by striking a wall rock with their hammers, the sound reaching the rescuers long before shouts could be heard.

Certain compact varieties of rock are such good transmitters of sound that even miners are often deceived into thinking that the source of the sound is much nearer than it really is. Some time ago, miners in a lower drift were working in an upraise to connect with another gang sinking a shaft or incline from the surface. No surveying instruments or surveyor being on the ground the miners trusted to sound and guesswork, with results not altogether satisfactory. The two parties were puzzled continuously, and daily, from the seeming closeness and the distinctness of the sound, it was expected that the next round of shots would make the connection. When this finally did occur, upraise and down shaft were very irregular pieces of tunneling.

CLOCK SUPPOSED TO STOP WITH DEATH

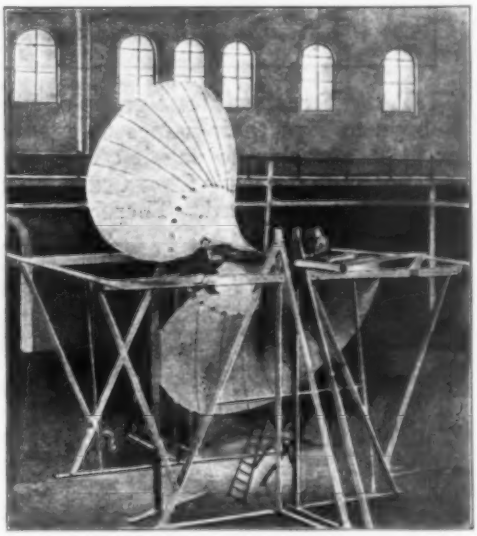
The famous clock on Hampton Court palace, England, is said by many superstitious people to stop when a person long a resident in the castle dies. The first instance recorded is that of Anne of Denmark, queen of James I. The clock, which was striking four at the moment, immediately stopped. Many other instances are quoted.



Clock Clothed in Superstition

HUGE PROPELLER FOR DIRIGIBLE

This huge dirigible propeller, called a helix, will be mounted at the front



Fan-Like Propeller for Dirigible

of M. Grosclaude's French dirigible, and is expected to beat the air in such a way that the airship will advance in any kind of weather. It is made of wood, covered with sail cloth.

X-RAY AND FORCEPS REMOVE TACK FROM BOY

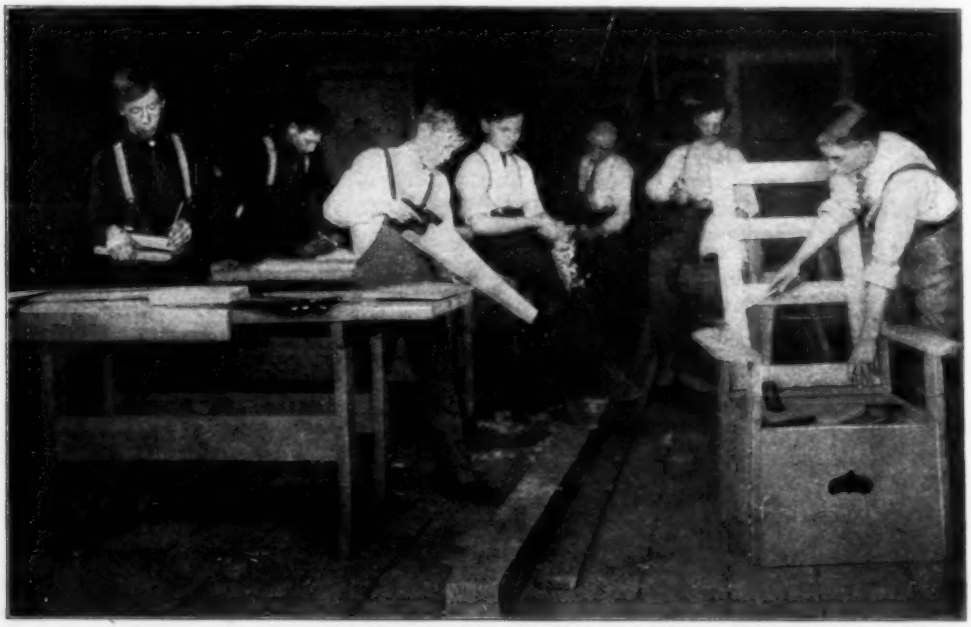
An interesting surgical operation performed recently at the Beth Israel hospital, New York, was the removal of a tack from the bronchial tubes of a 9-year-old boy who had been suffering for several weeks with a mysterious illness. The tack was located in the right bronchus by means of the X-ray, and then the X-ray was further used in removing it. A fluoroscope screen was placed on the boy's chest and an incision was made in the windpipe. By means of the shadow on the screen the surgeons were able to observe the progress of a long pair of delicate forceps that had been introduced into the windpipe. When the shadow of the forceps was seen to touch the shadow of the tack the difficult part of the operation was over.

WHAT A GROUP OF BOYS DID FOR THEMSELVES

By A. E. Holt

(Editor's Note—The Rev. Mr. Holt, while pastor of a church at Pueblo, Colo., was the moving spirit of the boys' organization which he describes. He is now pastor of a church at Manhattan, Kansas.)

IT TAKES real grit for a group of five boys to sign their names to a note for $100, agreeing to pay it off in one year with the proceeds from a carpenter shop not yet opened. There are so many ways in which such a project might fail. The boys might become tired and quit. They might quarrel, the public might not be interested in what they could produce, the shop might burn down. It was a big venture for a group of boys none of whom was over 15 years of age. And yet a group of boys at Pueblo, Colo., made this venture and achieved success.



The Boys' Club at Work in Their First Workshop

The inspiration for the venture came from the reading of Dr. William Byron Forbush's book "The Boy Problem," by Dan Wells, manual training teacher in the Pueblo schools. The loan was made by one of the members of the Congregational church of that city. The money was spent for tools and lumber and the Colorado Fuel & Iron Co. gave the use of an old barn for a workshop. The boys took orders for linen chests, ironing boards, medicine chests, towel racks, morris chairs, etc. There was no lack of demand for their labor and their products seemed to give satisfaction. They met two nights a week after school and spent one hour in the workshop. At the end of the first fifteen months the debt was paid off.

Very soon the club began to grow and there seemed to be a demand for some kind of a more elaborate organization. After several attempts at extemporizing one, the club finally decided to adopt entire the organization and ritual of the Order of the Knights of King Arthur. This furnished a high

ideal worked out in its various details in ritual and degrees and gave to each club the freedom to adopt such local features as it pleased.

The application for membership was made out on a blank form, and among the questions asked the prospective member were the following:

Do you believe that every boy should be master of his hands, and will you, so far as possible, use the means the club offers you to this end?

Do you believe that every boy should be master of his mind, and will you use the means the club offers you for reading and debating?

Do you believe that every boy should be a gentleman in social life, and will you join in the social life of the club and seek to make the best of it?

Do you believe that every boy should be strong in body, and will you, so far as possible, join in the athletic life of the club?

Do you believe that a boy is ruled by his ideals, and will you, so far as possible, join in the religious life of the club and be true to the ideals of the organization set forth in the successive degrees?

The club had a tennis court and a baseball team. The baseball team was defeated by just one team in the city league, and the tennis players developed on the club courts were easily the champions of the boy players of the city. One of them who went last year to Colorado college won the college championship as a freshman.

One of the features of the year's work was a summer camp located up in the mountains on the St. Charles river. Here the boys had a thrilling experience fighting a forest fire. Some one down the canyon started a forest fire, and with a change of the wind it was threatening all the buildings on the Hamilton ranch. I quote from the Pueblo Star Journal:

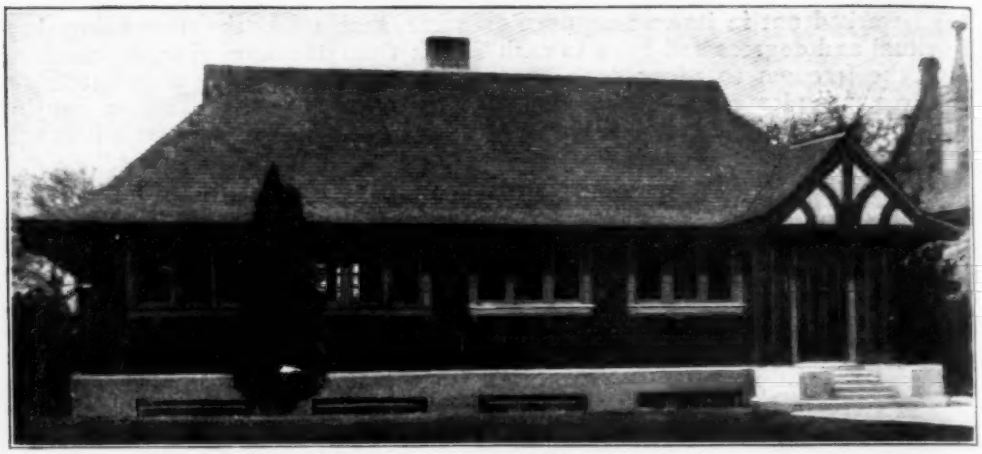
"At this juncture State Forest Ranger Mackelfresh arrived on the scene, took in the situation, and saw the need of quick work. He had no one to help him in his work, and organized the young Knights of King Arthur into a fire-fighting brigade. They were supplied with axes, and on Saturday and during a portion of that night worked valiantly, cutting a fire line a mile in length, to prevent the nearer approach of the flames. Their efforts were successful, the fire being kept back from the line. Mr. Mackelfresh complimented the boys and took the name and address of each, announcing that these would be sent with his regular report to the government."

By the end of the first year 50 boys were enrolled in the club, and the need of better quarters was imperative. A money depression seemed to have left the whole community feeling poor but some of us felt that no community was too poor to support a cause which was evidently paying big dividends in better manhood, and with a statement of what we had been doing, we went before the public promising larger results if they would put us up a building.

The fathers of the boys rallied to the support of the cause and unexpected friends like U. S. Senator Simon Guggenheim, Gen. William J. Palmer, and John H. Bradshaw of Chicago made the building possible.

The club is not all that it might have been. Very few organizations are, but that it has been a blessing to those who have been loyal to it I do not believe any one will deny. Two of those who have already graduated from it are conducting a similar work for other boys in other places. One of the happy

Knights of King Arthur in Camp



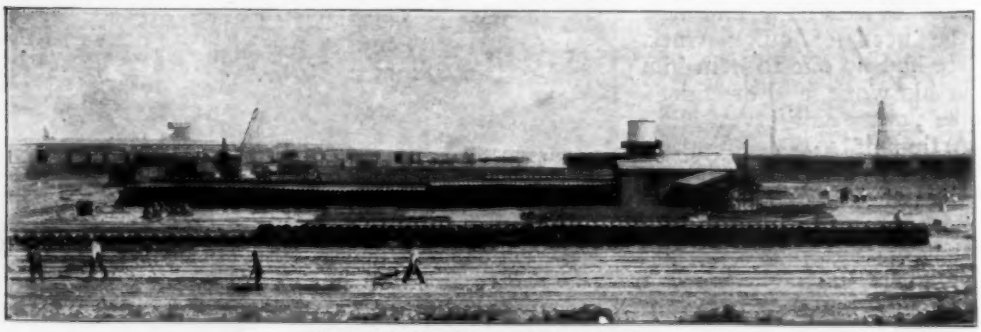
The New Home of the Boys' Club, Pueblo, Colo.

moments in my own life was the last night spent in Pueblo, when, seated at a banquet table around which were seated 50 boys, I was presented with a beautiful silver loving cup and a gold K. O. K. A. pin. Whatever the future may bring these two emblems stand for the best investment I ever made of my time and energy.

SAN FRANCISCO'S PIPE YARD

A complete pipe yard and pipe-testing plant has been acquired by San Francisco for the purpose of making exhaustive tests of all the cast-iron pipe to be used for the distribution of the 21,000,000 gal. of water that city is storing as a precautionary measure. Nearly 100 miles of pipe is required, and this is divided into eight sizes, ranging all the way from 8 in. to 20 in. in diameter, weighing from 515 lb. to 3,988 lb. per 12 ft., and tested to withstand static pressures of from 43 to 325 lb. per square inch. The different sizes and strengths of pipe arise from the fact that they are to be laid at different levels, and fed from different storage tanks whose elevations are 325 ft., 490 ft., and 755 ft., the latter being the Twin Peaks reservoir, which will be used in case of emergency.

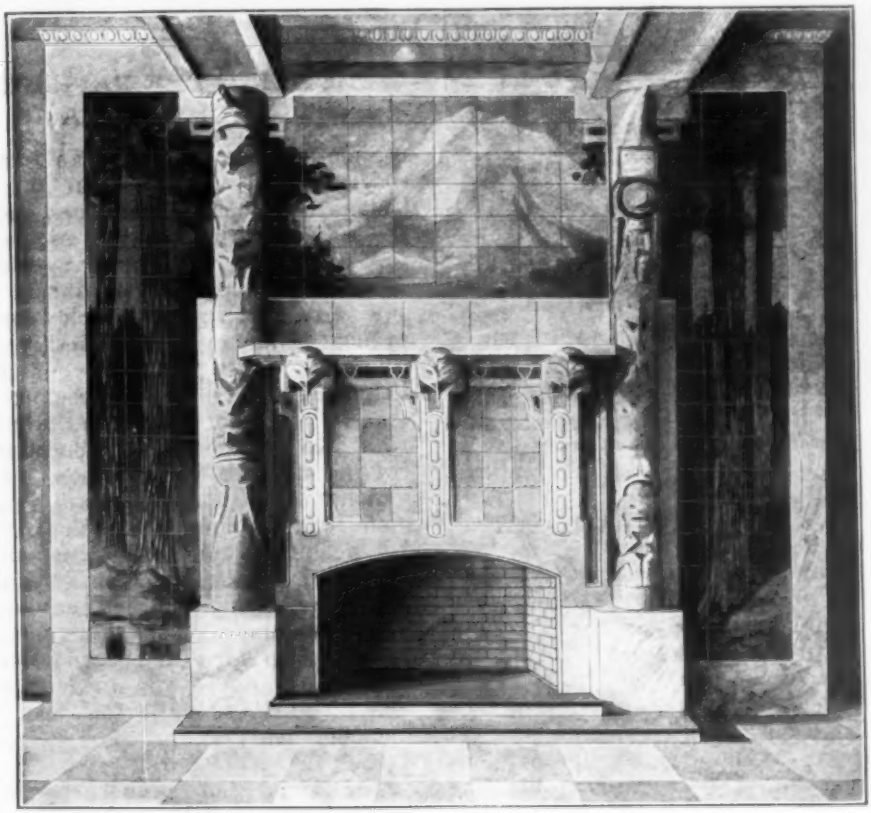
The pipe yard represents an expenditure of about $16,000, and is considered a good investment because it will insure the real worth of pipe costing a million dollars. The yard is equipped with a hydraulic testing press capable of exerting 600-lb. pressure per square inch. The yard is also equipped with a locomotive crane, and an electric traveling crane, which runs the entire width of the yard and piles the different classes of pipe in their respective places. The locomotive crane cost $4,500, and the electric crane $2,500. They handle eight carloads a day.



Municipal Pipe Yard and Testing Plant

ABORIGINAL AMERICAN MANTELPIECE

This bit of purely American art is a mantelpiece in the lobby of a newly constructed hotel at Seattle, Washington. The motive is Alaskan, and the whole decorative idea has been woven around the totem poles that are a feature of some of the native villages of the Northern Pacific coast. A view of Mt. McKinley and the trunks of giant pine trees, all worked out in tile, form the background.



Mantel of a Seattle Hotel

Foreign artists have often expressed wonder that American architects seldom make use of aboriginal American art in their designs.

¶A convention of collegiate aeroplane clubs is to be held at the University of Pennsylvania in June.

ALASKAN STEAMER SUNK BY ICEBERG

The steamer "Yucatan" of the Alaska Steamship company, was wrecked by a collision with an iceberg in Icy strait while en route from Valdez to Seattle with 65 passengers. The iceberg loomed up ahead out of a snowstorm too late to be avoided, and tore a hole in the vessel's side, near the bow. Luckily, Chichagof island was near and she was beached eight minutes later. The passengers and crew reached the shore in safety, where they camped out in cabins until taken off.

¶When a subscriber starts to swear on telephones in Denmark the operator switches the line onto a phonograph recorder, and the offender is confronted in court with conclusive evidence.

Courtesy Motor Cycling, London
The Tragedy of a Fancy Dress Ball

AN ALL-STEEL MAIL CAR

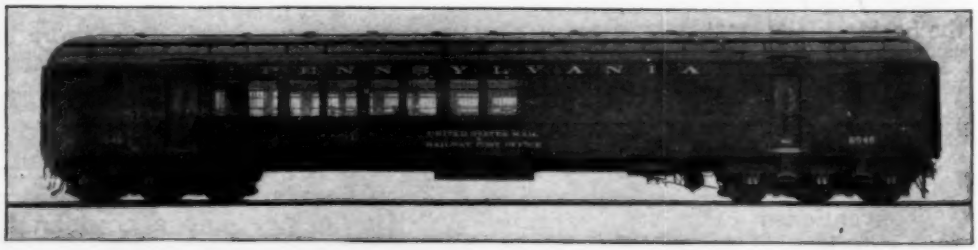
The illustration shows one of the improved all-steel mail cars that have been put in service on the Pennsylvania railroad. It contains in its construction less than 300 lb. of wood, even the letter boxes, interior mouldings, and sorting tables being of steel or iron. The floor is a fireproof composition laid on corrugated iron. The side walls are of steel sheeting, made to imitate wood by graining with paint, and collision bulkheads are provided.

In the wrecks of the past few years it has usually been the lightly constructed mail cars that suffered the most, but the new steel cars are as wreck-proof as the most improved ideas can make them. There have been many steel cars in use during the last couple of years, but they have all had ordinary woodwork for interior finish and afford but slight fire protection.

SHOOTING THE RAPIDS IN DUTCH GUIANA

Shooting the rapids is an exciting sport in most countries, but in Dutch Guiana the bush negroes, descendants of escaped African slaves, are so expert in the art that they traverse the dangerous rapids of the Maroni both day and night with as much calmness as most people evince in walking along a quiet street. In their frail-looking but strong dug-outs they transport passengers and supplies to and from the gold fields of the Lawa and the coast. On the up-stream trip which requires a month, the Guiana navigators propel their boats against the rush of water by means of long poles, but on the down-stream trip, made in three days, the boats rush along on the flow of water, shooting rapids and falls with rarely a stop until the coast is reached. The up-stream trip often covers a period of 30 days, while the dash from the gold fields to the coast is accomplished in two or three days.

The boats used by these negro rivermen are about 25 ft. long by 3 ft. wide, and are made of cedar logs. A log of sufficient quality and length is

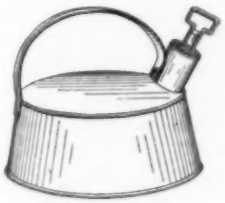


Wreck-Proof Mail Car

dug out, and then it is raised upside-down and small fires are built about it. When the interior has become charred to a sufficient depth to allow the rough surface left by the digging to be smoothed off, wedges are driven across. Then 1-in. strips of wood are solidly nailed across from gunwale to gunwale, and after the removal of the wedges the boat is ready for the water. It is the type of boat resorted to by all races of men in their primitive stages, and provides as excellent a means of transportation as the modern boat of like type.

A WHISTLING TEA KETTLE

A tea kettle that whistles cheerily, to let the housewife know that the water is boiling and that the gas may be turned down, has been introduced in England, and is meeting with much favor. The kettle, as the drawing shows, has no lid through which the scalding steam may issue, but is filled and emptied through the spout which is sufficiently large. The absence of the lid not only prevents scalding, but keeps any of the steam from escaping, which means that the water will reach a boiling point much more quickly than in the ordinary kettle. In the spout is a stopper which contains the whistle, and this is the safety valve of the kettle as well as the means by which announcement that the water is boiling is made.



MAGNET DRAWS NAILS FROM RIVER BOTTOM

A powerful electric magnet has just been used with great success in recovering 15,000 kegs of nails which went to the bottom of the Mississippi river when a barge sank near Lafayette street, New Orleans. The magnet was sent from one of the big steel plants in Pittsburg for the express purpose of recovering the nails.

The operation of the magnet was very simple and very sure. Attached to a suitable hoisting gear it was lowered into the water and then charged with electricity through a controller in the pilot house. At every hoist, from one to three kegs would cling to the 3-ft. diameter of its head.

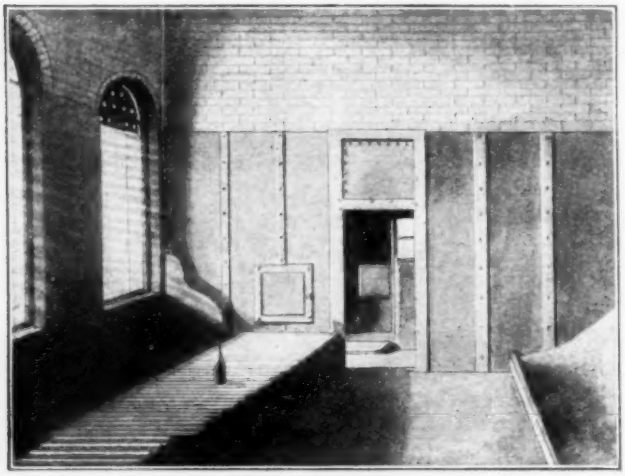
Three Kegs Clinging to Magnet

RADIATORS TO CARRY COOLNESS IN SUMMER

Every room in Chicago's latest hotel skyscraper is fitted with a thermostat that will turn steam into the radiators in winter, and fill them with brine or liquid air in summer, regulating the temperature at all times, whether it is 10 below zero or 100 in the shade. The installation is considered the most modern improvement of this kind in any building in the world.

LIGHTHOUSE DESTROYED BY SCHOONER

The lighthouse at Thimble shoal, in Hampton Roads near Old Point Comfort, was recently destroyed by being run down by a schooner. The schooner, which was being towed by a tug, failed to answer her helm properly, and crashed into the lighthouse, overturning a stove. This set fire to the large stock of oil, and as a result the entire structure was destroyed. The schooner escaped without serious injury.



Thimble Light

TESTING GUN BARRELS IN ENGLAND

Most of the small arms manufactured in England for trade purposes are tested at the Birmingham or the London proof houses, and are there provided with marks, stamped in the barrels, which testify to their trustworthiness. The most important of these tests is the exploding of a charge in each barrel.

Firing Chamber for Testing Gun Barrels

The interior of the firing chamber is shown in the illustration. It is a strongly built brick vault, lined with iron to a considerable height. The windows are provided with metal plates, which are closed at the moment of firing. Running beneath the windows is a low, lead-covered bench, grooved to take 118 barrels at a time. The barrels, in the state for provisional proof, with plugs attached and touch holes drilled in the plugs, are loaded with the proper charges of powder and lead in an adjoining room. Then they are placed in the grooves of the bench and a train of powder is run along from one to the other. Behind the bench is a bank of sand, and on the opposite side of the room one of sawdust. The train of powder being properly laid, the iron doors and window shutters are closed, and the operator in an adjoining room pulls a wire attached to a hammer on the bench. This hammer explodes a cap, the train of powder is ignited, and all the barrels explode. The barrels recoil backward into the sand, and the projectiles, bullets or shot, as the case may be, are fired into the sawdust. After the firing, if the guns come out of the tests successfully, they are stamped with a crown and the letters "B. P." which shows that they were proved at Birmingham. Sparrows nest in the roof of the firing chamber, seemingly undisturbed by the explosions.

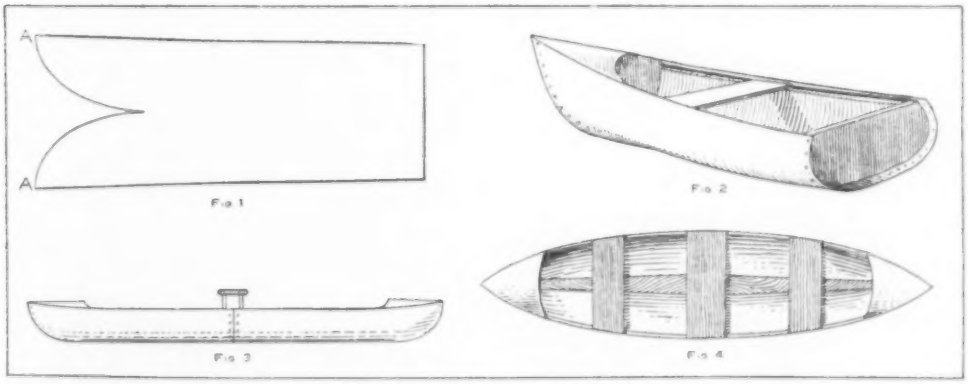
SHOP NOTES

How to Make a Steel Boat

Secure two pieces of sheet metal, preferably galvanized, each sheet with a length equal to one-half the desired length of the boat. Cut each piece to the shape shown in Fig. 1. Bring the ends AA together and rivet them as shown in Fig. 2. The pointed end should be covered, inclosed, and soldered to make an airtight compartment.

The halves can be joined together in two different ways, either by bringing the fore and after parts together and riveting them, or by putting a tight bulkhead in each half as shown in Fig. 2, and joining them together with the seat as shown in Fig. 3. If the latter method is adopted, the ends should telescope just a little, and be held together by the standards of the seat.

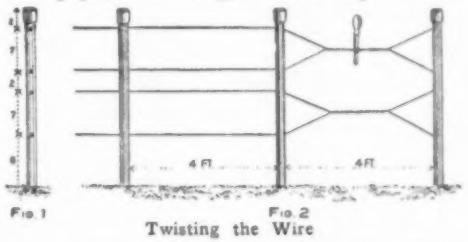
Should an accident occur it would only be necessary to raise the seat and allow the leaky half to sink while the occupant could float safely away in the other half. It would be advisable to use the best quality of paint.—Contributed by W. D. Brooks, Paterson, New Jersey.



Detail of the Sheet-Metal Boat

How to Make a Twisted-Wire Lawn Fence

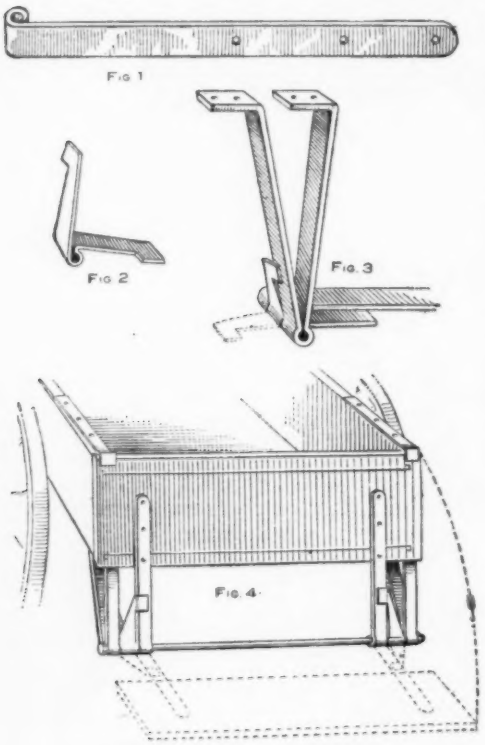
Procure several iron posts, enough to complete the length of the fence when they are set 4 ft. apart. A piece of 2-in. pipe, 5 ft. long, with a cap turned on the top makes a good post. Drill four holes through each post as shown in Fig. 1, and place them in the ground as you would an ordinary post. Run a strand of wire through each hole loosely, but be sure to get the slack in the wires equal. Place a small bar of iron, a screwdriver will do, between the two top strands of wire and twist them to take up the slack as shown in Fig. 2. Twist the two lower strands in the same manner. If the wire becomes slack at any time, a few turns will tighten it.—Contributed by J. F. Campbell, N. Somerville, Mass.



Twisting the Wire

Combined End Board and Step for a Light Wagon

The accompanying illustration shows an end board attached to a wagon in such a way that it can be lowered and



The End Board Turns Down

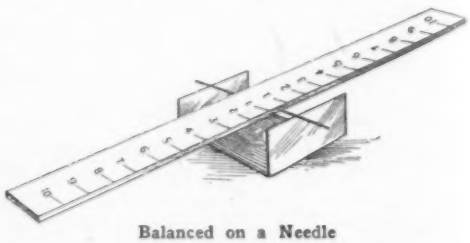
used for a step. Two straps of iron, one of which is shown in Fig. 1, are similar to one side of a hinge with the end board bolted to their upper ends. The eye made on the other end of the straps is slipped over a rod which passes through two brackets attached to the under side of the rear end of the wagon box. The catch that holds the end board in position for the step is shown in Fig. 2. One of these catches is provided for each bracket and hinge strap. They are attached to the bracket and rod as shown in Fig. 3. The complete arrangement appears as in Fig. 4. The dotted lines show the location of the step when the end board is lowered.—Contributed by R. C. Knox, Colorado Springs, Colo.

A Substitute for a Balance

Procure a strip of pine wood, about ⅜ in. wide and 12 or 15 in. long, and place a fine needle through the middle of the wood or attach it by means of wax. Then get a piece of sheet tin or other metal, ½ in. wide and 1 in. long, and bend its edges up ¼ in. on each side. Place the needle ends on these upturned portions of the tin. Should the beam not balance perfectly, cut off thin pieces of wood from the heaviest end until it does balance. Divide the strip of wood into 20 equal parts, 10 on each side of the middle, and mark them 1, 2, 3, etc., with the smallest numbers at the middle.

Three weights are required, 1-gr., 1/10-gr. and 1/100-gr. The 1-gr. can be made by weighing out a piece of thin brass wire on a chemist's balance. The wire should be bent double. The 1/10-gr. is obtained by placing the 1-gr. weight on one side of the balance at the point marked 1, and putting a smaller piece of wire on the 10 mark at the opposite end of such size as will place the beam in perfect balance. This wire will be the 1/10-gr. weight. The 1/100-gr. weight is obtained in the same manner as the 1/10-gr., using the 1/10-gr. weight to start with instead of the 1-gr. weight.

A button of gold or silver is weighed by placing it on one of the 10 marks and one of the weights on the opposite 10 mark that will make the beam balance. The weight placed on the 10 mark represents the weight of the gold or silver button. If the wire weight is too heavy, move it toward the middle



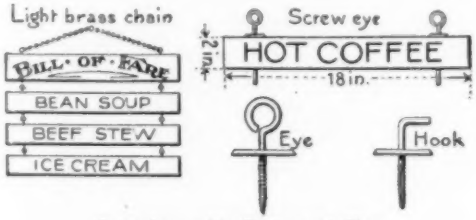
Balanced on a Needle

of the beam to a mark where it will be a little lighter than the button. Leave both weight and button in these posi-

tions and take the 1/10-gr. weight and place it on the end of the beam, then move it toward the middle until it rests on a mark where this weight, together with the first weight, is a little lighter than the button. Then proceed with the 1/100-gr. weight in the same manner. For example, suppose that the 1-gr. weight is on 8, the 1/10-gr. weight on 7, and the 1/100-gr. weight on 3; the weight of the button is .873 grains, or a little more than 8/10 of a grain. Another problem; if a certain weight of ore yields 8/10 gr., how many grains will there be in a ton of similar ore? There are 29,166 troy ounces in one ton. The number of ounces of precious metal in a ton of ore can be readily figured out.—Contributed by F. B. Percival, Paramaribo, Dutch Guiana.

Bill of Fare Sign for Restaurants

The accompanying sketch shows how the owner of a restaurant made



Interchangeable Restaurant Sign

a sign which could be quickly changed at any time. The top board is 5 in. wide and 18 in. long. The others are all 2 in. wide and 18 in. long. Each board carrying an inscription is attached with hooks and eyes as shown. This makes it possible to remove a board or any number of boards when the bill of fare is changed.—Contributed by H. G. Cramer, S. Greensburg, Pa.

A Lumber Yard Burglar Alarm

The accompanying sketch shows how I constructed an alarm to catch a thief taking lumber from my yard. An ordinary electric bell with two dry cells was used in the circuit, but the main feature was the contact points. These I made from a hose supporter clip with one jaw insulated and a piece of lead attached as shown in Fig. 1.

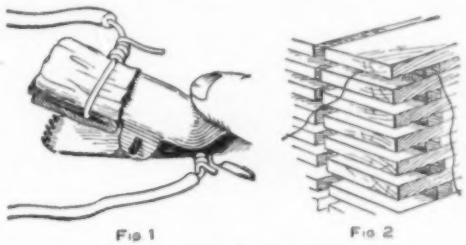


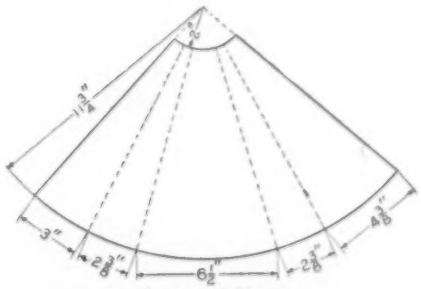
Fig 1 Fig 2

Contact Points for the Current

When the clip was held apart, the current was broken. I placed the clip under the top board of a pile of lumber, as shown in Fig. 2. The wires were run to the office and attached to the bell and battery. When the board was taken from the pile the clip closed and made the connection for the current. The thief was caught.—Contributed by J. S .Grant, Winchester, Va.

A Wedge-Shaped Electric Light Shade

Take a piece of cardboard and lay it out according to the dimensions given in the accompanying sketch. Cut it out on the heavy lines and then bend it on the radial dotted lines and fasten the edges with paper fasteners. The result is a wedge-shaped shade which will just fit an electric light bulb and when it is in place will throw a wedge-shaped block of light. This is an im-



Layout of Shade

provement over the round shade which allows the light to strike the eyes.—Contributed by J. H. Crawford, Schenectady, N. Y.

Line Wire Supports for Trees

Almost all devices for attaching line wires to the body of trees will injure their growth in some way. Fasteners of any kind should never be nailed to

Clamp Attached to a Tree

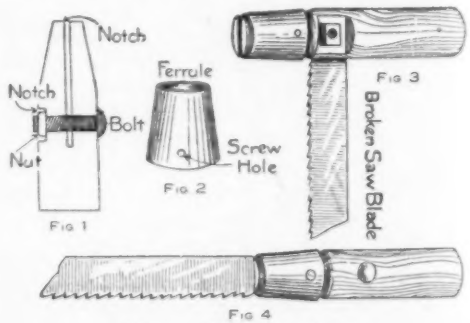
the tree or wires tied closely around the limbs. Tall trees, having limbs only at the top can be used for a line wire support by attaching a clamp on the main body as shown in the sketch. This clamp will not injure the tree in any way as there is nothing driven into it. The clamp consists of four pieces of pine, or some other suitable wood, cut on a curve to fit the trunk of a tree, four bolts, and a 2 by 4-in. upright piece. Two of the curved pieces are nailed to the upright piece as shown. A board is nailed on top of the end grain of the upright piece to prevent the rain from entering the wood and splitting it. The two parts are bolted together on the tree trunk and one or more insulators are attached to the upright piece as may be necessary.—Contributed by O. E. Trounes, Chicago, Illinois.

Oil Slots in Center Holes

Some attention is required to keep the piece of work lubricated that runs on the dead center of a lathe. The hole must be oiled when the piece is put in the machine and after it warms up under the cut, the lathe must be stopped occasionally and the center run back so that more oil can be applied. The following is a good way to treat center holes—in fact it is the method used in many shops: Three small slots are cut in the center hole from the outside down to the middle. A 3-cornered file is ground off on the end to 60 deg.—the angle of the lathe centers—and the edges sharpened. This is used as a tool for cutting the slots. The three slots are cut at equal distances apart, and deep enough to carry the oil to the center of the hole while the piece is turning on the center. The slots are cut in large work with a round-edged chisel. Any burr left after cutting the slots must be removed with the center drill.—Contributed by Donald A. Hampson, Middletown, New York.

Adjustable Handle for Using Broken Hacksaw Blades

A broken hacksaw blade is usually laid aside with regret, especially if the blade is of any considerable length. The device illustrated will prevent a broken blade from becoming entirely useless. It is made of a short piece of broomstick, Fig. 1, notched and tapered to receive a ferrule, Fig. 2. A bolt is run through the side at right angles to the slot and a square-shaped depression is cut out to receive the nut. The saw blade is slipped down in the notch and the bolt run through and tightened. Then the ferrule is slipped



Using a Broken Hacksaw

on and fastened. It is also adjustable to the positions shown in Figs. 3 and 4.—Contributed by James M. Kane, Doylestown, Pa.

A Home-Made Power-Driven Vacuum Cleaner

There are comparatively few households that can afford to own a vacuum cleaning outfit. It is possible, however, with a few simple tools and materials and two or three evenings of work, to build a machine that will compare very favorably with those now on the market.

This pan, shown at C, must be fitted with two valves which are the most important and difficult part of the work. Cut, from a smooth piece of pine, 1 in. thick, two discs 5 in. in diameter with a 3-in. hole in the center of each. From a plumbing supply house, procure a sheet of packing rubber, ⅛ in. thick,

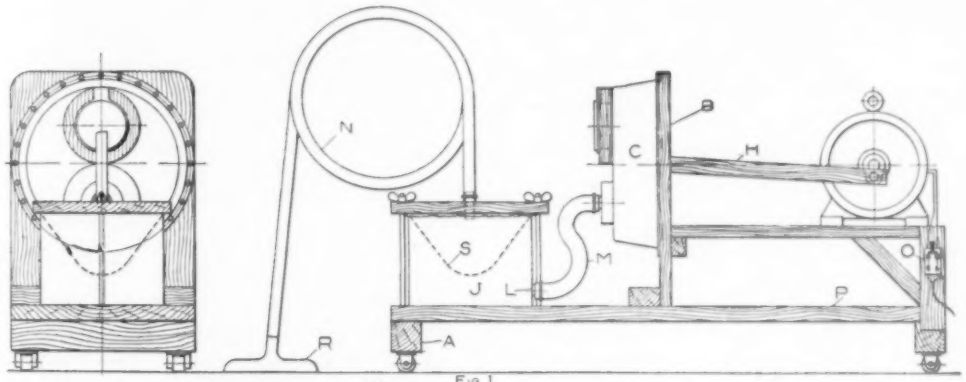


Fig. 1

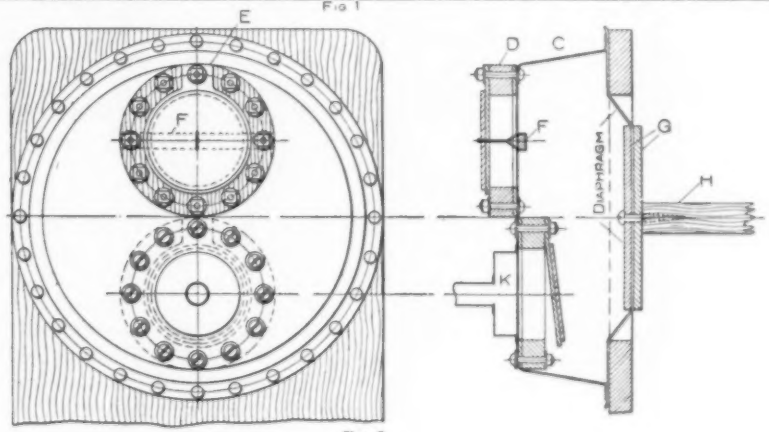


Fig. 2

General Layout and Details of a Vacuum Cleaner

First take a good pine board, 1 in. thick, 12 in. wide, and 36 in. long, and nail to each end a 12-in. length of 2 by 2-in. pine, as shown at A in Fig. 1 of the accompanying sketch. Next, a ¾-in. board, 12 in. wide and about 15 in. long, should be fastened near the center and at right angles to the first board, as shown at B. Procure at a hardware store a tin pan measuring about 10 in. in diameter and 3 in. deep. and cut from it two discs, each 5 in. in diameter, and two, 3½ in. in diameter. One of the discs of wood should be fastened to the back of the pan at the top, as shown at D, Fig. 2, with one of the 5-in. diameter rubber discs placed between the tin and the wood, and both secured to the tin by a row of small bolts around the outside edge of the wood. A hole, 3 in. in diameter, can now be cut through the tin

and the rubber, using the hole in the wood as a guide. Two discs, with a diameter of 3¼ in. should be cut from cigar-box wood and fastened centrally on the 3½-in. rubber discs. One of the latter pieces should be fastened by its top edge to the top edge of the 5-in. disc of wood as shown at E. This forms a flap valve, and great care should be taken to see that the rubber disc covers the opening all the way around when the valve is closed, so that it will be airtight. A spring will be necessary to quicken the action of this valve. This is best made by fastening a narrow strip of wood across the valve opening on the inside of the pan, as shown at F, and attaching a rubber band to the center of the valve and to this stick. This completes the outlet or exhaust valve. Another valve must now be made in the same manner and fastened to the bottom of the pan on the inside, as shown. This is the inlet valve and works in the opposite direction to the outlet valve just described.

Next procure a piece of leatherette or pantasote about 12 in. in diameter, or large enough to cover the opening of the pan. This is to be used for the diaphragm. Cut a round hole about 8 in. in diameter in the upright piece B, Fig. 1, its center about 7 in. from the top. From a piece of ½-in. pine cut two discs 6 in. in diameter. Also secure a piece of hardwood, H, 1 by 1 by 14 in. The discs, G, should now be placed, one on each side of the leather diaphragm, exactly in the center, and fastened to one end of the 14-in. piece by means of a long screw. This piece H should be exactly in the center of the diaphragm. The pan can now be put in place. Place the diaphragm over the hole in the board B, the stick projecting through the hole. The pan is now placed over the diaphragm and held by means of small bolts around the edge. The diaphragm between the wood and the tin acts as a gasket and makes an airtight joint.

Secure an airtight tin can about 8 in. in diameter and 12 in. high and fasten it to the baseboard as shown at J, Fig. 1. A tin cover such as a baking powder or coffee can cover should now be soldered over the inlet valve as shown at K, Fig. 2. Solder a hose connection in the center of this cover and also one in the side of the can as shown at L, Fig. 1. Couple a short piece of hose, M, to these connections. The strainer, S, should be made of very strong and closely woven unbleached drilling. Make it in the form of a bag with a 1-in. hem at the top, and place it in the can as shown by the dotted line, having the hem fit smoothly over the outside edge of the can. The top of the can is made from a perfectly flat pine board about 1 in. thick, and is held in place by two ¼-in. rods fastened in the baseboard. These rods have thumb nuts on the top which allows the cover to be readily removed or tightened down. It is best to place a rubber or leather gasket between the cover and the edge of the can so as to make an airtight joint.

An airtight piece of garden hose may be used for the suction hose, N, the one end being fastened in the center of the cover and the other to the brush or nozzle, R, Fig. 1. It is best to buy this nozzle as it would be rather expensive and unsatisfactory if home-made.

This machine may be driven by an electric motor of about 1¼ hp., which should be placed in the position shown in Fig. 1. The end of the stick H is fastened to a crank on the motor shaft and allowed to have about a 1½-in. stroke. The motor is wired up with a switch, O, and it would be best to connect in a rheostat, if the builder has one, to allow the regulation of speed best suited to the machine. This can readily be determined after the machine is started. If the builder is not fortunate enough to possess an electric motor and the current necessary to run it, a small water motor will do equally well; or it may even be run by hand, by means of a long lever, fulcrumed at P.

The machine is now ready for operation. First, however, test it all over for leakage, as its success depends upon being perfectly airtight. As the motor

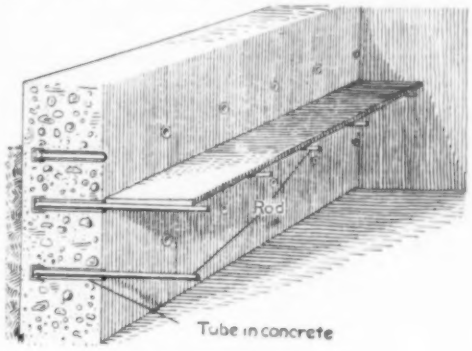
revolves, the rod H is drawn forward bringing with it the diaphragm. This creates a partial vacuum in the tin pan, C, which opens the inlet valve, sucking the air through the suction hose and strainer, the air carrying with it the dust and dirt. The refuse is left in the strainer bag while the air goes on through the connecting hose and pan, and outlet valve into the atmosphere. After the article being cleaned has been gone over thoroughly, care being taken to hold the nozzle flat and tight against the material, the cover may be removed and the bag emptied. The quantity of dirt found in the bag will be sure to convince the operator of the efficiency of the machine.—Contributed by Paul S. Winter, Greenville, Pa.

A Jeweler's Eyeglass Holder

Using an eyeglass for any length of time becomes tiresome for the muscles of the face. The accompanying illustration shows how a little attachment can be used so the wearer will not have any more discomfort than wearing a pair of nose glasses. A small hole is drilled through the rim of the eyeglass to suit the clamp of an ordinary nose piece used on glasses. The clamp is bent to fit the rim and the screw placed in position. The nose piece will hold the eyeglass as securely as it will a pair of ordinary glasses.—Contributed by H. D. Chapman, Washington, D. C.

Shelving Brackets for Cement Walls

When constructing a cellar or basement wall of concrete for a house or factory place iron pipes horizontally in the forms in a row where shelves are wanted so their inside ends will be flush with the finished wall. The pipe should be ½ or ¾ in. in size, and of such a length as to not quite reach through the wall. It would be well to screw pipe caps on the ends placed in the concrete. The pipes should be placed close enough together in each row to keep the shelf boards from sagging. Fit each pipe with an iron rod

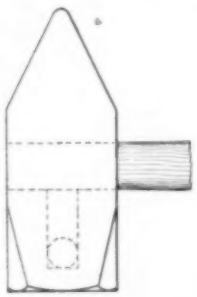


Removable Brackets

of sufficient length to slide in the pipe and have enough projecting on which to lay the shelves. When the shelves are not needed, the iron rods can be pulled out, thus clearing the surface of the wall. Where concrete walls extend all the way up, this method can be used anywhere in the building.—Contributed by H. Horace Romig, Allentown, Pa.

A Non-Rebounding Hammer

A hammer that will not rebound when a blow is struck, and one that will not cause that soreness in the wrist after a hard day's work is shown in the accompanying sketch. The hammer head is forged in the usual manner and a ½-in. hole drilled through the face to the handle hole, before tempering the steel, then the outer end of the hole is plugged and the hammer head heated and tempered. Insert a ½-in. steel ball in the hole, put the handle in place and the hammer is complete. When a blow is struck with the hammer, the ball strikes instantly and prevents the rebound.—Contributed by H. C. Faber, Monongah, W. Va.



Picture Frame Clamp

Various devices are used to clamp miter joints while the glue sets, yet none provides a way to hold four joints

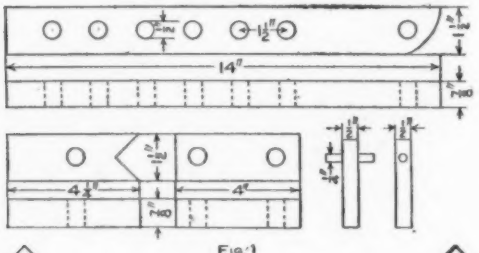


Fig. 1

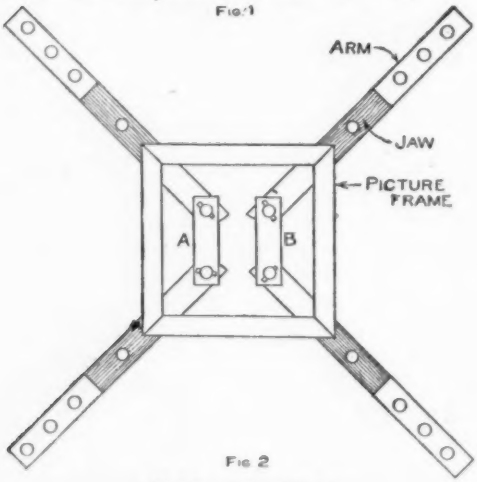


Fig. 2

Details of the Clamp

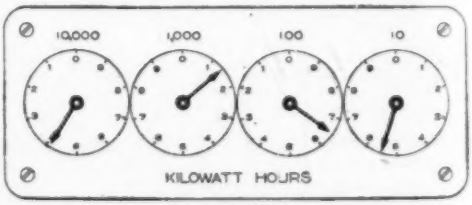
of a picture frame at one time, and hold them in such a way as to make the frame perfectly square when it is finished. Illustrated herewith is a clamp having four arms on which are four adjustable, V-shaped jaws that draw together simultaneously with the pressure from one screw clamp. The dimensions of the parts are shown in Fig. 1, and they appear as shown in Fig. 2 when put together with a picture frame in the jaws. The jaws of the screw clamp are applied to the cross-ties at A and B in Fig. 2. The drawing of these two cross-ties together pulls the four extending arms concentrically, thus drawing all four corners of the frame together and keeping it perfectly square while the glue sets. The jaws of the picture frame clamp are adjustable on the extending arms for different sized frames.—Contributed by Herman G. Gesswein, Brooklyn, New York.

How to Read a Wattmeter

Meters for measuring the amount of electrical energy furnished to consumers are known as recording or integrating watt-hour meters and are made in several different forms to meet varying conditions. The registration of a meter must be very accurate to meet commercial requirements owing to the fact that errors are cumulative and even a small percentage error will, in time, become important from a financial standpoint.

Electric power is measured in watts, and is represented by a current of 1 ampere under a pressure of 1 volt per second. Thus one watt is equal to 1-746th of a horsepower. The kilowatt is 1000 watts and the kilowatt-hour is 1000 watt-hours.

The dials on a wattmeter are arranged similar to those on a water or gas meter. The dial at the right is the lowest reading dial and gives the kilowatt-hours, each division corresponding to the use of one kilowatt-hour of power. The next dial to the left records tens, the next hundreds, the next thousands, and so on. Read from the left to the right, taking the smaller of any two numbers between which the pointer may stand. As an example, take the dial shown in the sketch in which the lowest division is 10 kilowatt-hours. Starting with the left hand dial, the pointer is between 5 and 6, so the reading is 5. For the next dial



Dial on a Meter

the reading is 6; for the next, 1; and for the next, 4; so that the whole reading will be 4,165; but as the last dial reads in tens, the number of kilowatt-hours recorded is 41,650.

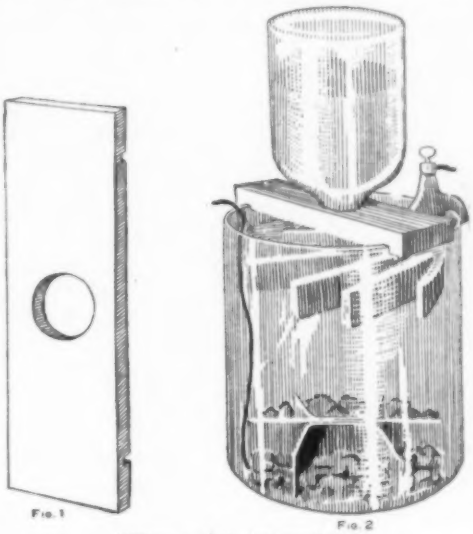
How to Treat Knots Before Painting

Knots and sappy places in boards are hard to cover with paint so that it will stay for any length of time. It has always been a problem with painters to effectually treat such places before laying on a coat of paint. The usual way is to cover them with one or two coats of shellac, and sometimes apply aluminum leaf, but this is not sufficient, especially if they are in a position where the rays of the sun will fall upon them.

The only way to kill bad knots and sappy places is to draw out as much sap as possible before covering them up with paint. This can be done with a gasoline torch, such as is used by painters and electricians. Hold the torch with the flame striking the knot or sappy place until the wood surrounding it begins to char. If the knot is an exceptionally bad one, and located in a prominent place, such as a porch column, trace around the knot with a piece of charcoal, lay a sheet of white asbestos on it, and rub over the outside surface around the edge of the knot to transfer the charcoal marking to the asbestos. Cut the asbestos out on the marks, thus making a hole the size of the knot. Lay the asbestos on the wood so it will cover all the surface, leaving the knot exposed. Apply the heat as before. In this way the sap can be drawn without injuring the wood surrounding the knot. After the sap has been drawn, apply a coat of shellac, and when dry smooth up with a putty made from whiting, white lead and Japan gold size. Knots treated in this manner will not show through the paint.—Contributed by S. Nelson, Chicago, Ill.

Automatic Filler for Gravity Cells

Telegraph companies and anyone using gravity cells have no little trouble in keeping the jars filled with liquid. The level of the liquid must be kept near a certain point to have the cell produce the required current. The accompanying illustration shows a device that will automatically fill each jar and keep the level of the liquid at almost the same point at all times. Each



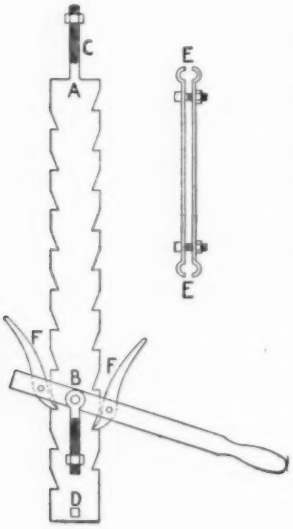
Filling a Cell Automatically

jar is provided with a wood holder, as shown in Fig. 1, which is placed across the top and the neck of a bottle inserted in the hole with the bottle inverted as shown in Fig. 2. The bottle is filled with liquid. Just as soon as the level of the liquid in the jar is lowered below the mouth of the bottle by evaporation, the liquid will run from the bottle and supply the deficiency. When the jar is filled to the proper level, which is about level with the mouth of the bottle, the liquid will stop running from the bottle.—Contributed by J. A. Harrill, Mooresville, North Carolina.

¶The use of acetylene for mine lights has the advantage over candles and kerosene as a fuel. Candles will remove seven times and kerosene five times as much oxygen as acetylene. The products of combustion given off by candles are ten times and from kerosene nine times that of acetylene. The light from acetylene will reach the part to be illuminated, while that from candles or kerosene will be lost in the smoke and mist which so rapidly accumulate.

Tightening Elevator Belts

Tightening elevator belts is not a very desirable task, as anyone who has had much of it to do knows, says a correspondent of the American Miller. The accompanying sketch shows a simple tool for tightening and holding the belts which works to perfection and which can be made by any blacksmith. First secure two common wire stretchers from a hardware store and have a blacksmith remove all the chains and hooks. Then instead of the chain on end A have a 4-in. bolt made of ½-in. iron welded on, and where the hook fastens on at point marked B have a ring bolt put on so it will work easily. Then take the handle off one side and put on the opposite side so you will have one right and one left-hand stretcher. This is in order to work both bolts on the inside. Also have a pair of clamps made as shown in the sketch.

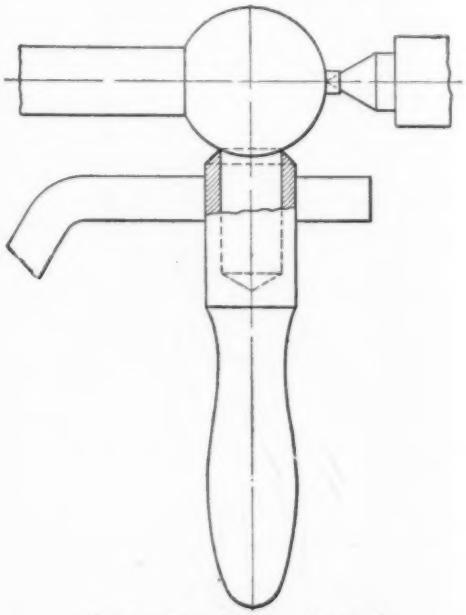


In operation, put one clamp on each end of the belt, screw them up tight, using ⅜-in. bolts to go through them. Put them on square, then slip bolt C through opening E in clamp, and screw up until you have a full thread; then grasp handles F and pull them toward the pulling bar (which lowers the handle to which lower bolt is fastened) until the bolt fastened on it will go through the opening E in lower clamp. When both clamps are on and both stretchers connected, all you have to do is to work the lever up and down to get the belt as tight as you want it; then the stretchers will hold the ends until you can fasten them. By grasping the handle it will slacken up. Take the clamps off and lay them away for future use. The clamps should be made long enough for the stretchers to work outside of the legs of the elevator.

This device costs very little and will last a lifetime. It can be carried in a tool box and takes up very little room as the handles can be taken off by removing stove bolts D at the lower end of the pulling bar.

Tool for Turning a Round Ball

A perfect ball can be turned on a lathe with a special rotating tool rest, but some lathes, and especially wood lathes, are not provided with this attachment. The tool as shown in the illustration makes it possible to turn a ball without the aid of a rotating tool rest. The tool is made from a round bar of tool steel turned up as shown



Detail of the Ball-Turning Tool

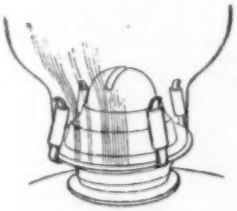
and a hole drilled in one end. The metal around the hole is chamfered and hardened for a cutting tool. The chamfered edge is then ground, taking

care to keep the cutting edge on a perfect level. This is done by applying the edge to a surface plate during the grinding to see if it is kept straight.

The ball on a vise screw is a fitting example in using the tool. The material is put in the lathe and roughed off to the size and then the tool is applied by hand. The sharp edge of the tool chips off the high places until a perfect sphere is obtained. The process is then continued until the proper diameter is made.—Contributed by J. R. Weaner, Plainfield, N. J.

Holding Lamp Chimneys on Burners

The ordinary lamp chimney, setting in the four standards of the burner, often falls from its place when the lamp is not carried cautiously. Many chimneys are broken in this way. An easy way to keep the chimney in place is to procure some small rubber hose similar to that used by milliners in covering the stems of artificial flowers, cutting four pieces, each about 1 in. long, and fitting one piece on each of the four spring posts of the burner. The lamp may be turned upside down without danger of the chimney falling from its place. This rubber hose will last for months as the heat does not reach the lower part of the chimney or the burner base.—Contributed by Chas. Manasco, Memphis, Tenn.



A Brake for a Truck

A big truck with a load of 600 or 800 lb. is hard to handle and especially so on a slight incline. These trucks are constructed without brakes as they are generally used on a level surface. A brake attachment is quite easy to make and fasten to a truck where it is to be used on an uneven floor. One piece of hard wood as wide as the face of the truck wheel and shaped as shown in the sketch can be fastened loosely to one of the handles with a bolt so it will swing free of its own weight and not touch the wheel. A slight pull with the fingers on the lever will apply the brake. The wood lever can be put on either side of the handle to suit the position of the truck wheel.—Contributed by D. Higbee, Omaha, Nebr.

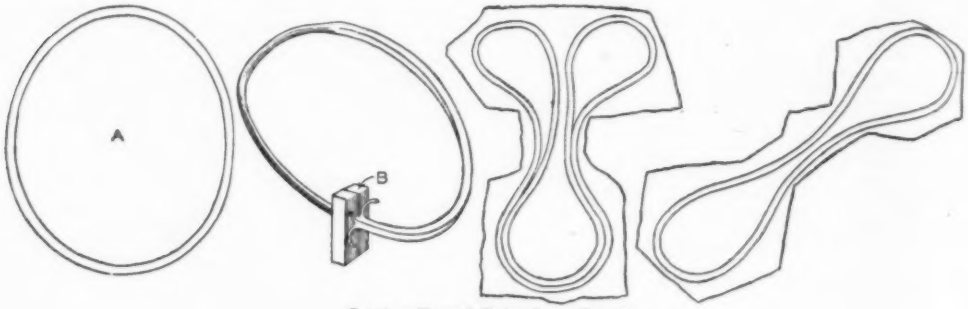
Brake Attached to a Truck

Courtesy American Vehicle

Corner Design for Carriage Bodies

A Round Leather Belt Without a Joint

At first thought this would seem impossible, but it is a very simple matter to make leather belts without joints of any kind. First cut out a large narrow washer A and then draw it through a split die B the same as making an ordinary round belt.

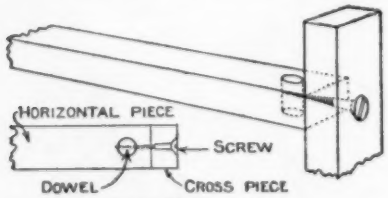


Cutting Round Belts from Leather

If the belt is to be a long one, the blanks need not be circular but can have a dumb-bell or other shape, depending on the shape of the piece of leather. The important thing to remember is to avoid sharp turns.—Contributed by E. W. Davis, Chicago.

Making Screws Hold in the End Grain of Wood

It is often necessary to fasten one piece of wood to the end of another by means of screws. Wood being a fibrous material, it can be readily understood that when a screw having sharp threads is put in the end grain parallel to these fibres the threads cut them in such a way that, when an extra strain is put upon the parts, the screw pulls out, bringing with it the severed fibers. The accompanying sketch shows how this difficulty may be overcome, and at the same time make the screw hold firmly. A hole is bored and a dowel, preferably of hardwood, glued in it, the grain at right angles to that of the piece.



Screw-Holding Joint

The size of the dowel, and its location, can be determined by the diameter and the length of the screw. The dowel need not extend all the way through the piece, but should be put in from the surface where the grain of the dowel will be least objectionable.

When putting screws in hard wood much labor will be saved by applying soap to the threads.—Contributed by Geo. M. Gaither, Baltimore, Md.

How to Make Sandpaper

Sandpaper, or, more generally speaking, glasspaper, is the chief abrading material used in woodworking, and consists of strong paper coated with powdered glass. In the manufacture of glasspaper, first the glass is washed and sorted, and then broken very fine by stamps or other machinery. The glass chiefly used for best glasspaper is that from old port wine and stout bottles; this, when pulverized, is of a golden color. The different grades of glasspaper are numbered from 3 to 0, and even finer, and there are corresponding sieves to divide the various grades, or to "size," as it is technically called. These sieves are numbered from 140 to 30, the numbers representing the number of meshes per lineal inch; the finer sieves are covered with Swiss silk, the remainder with woven wire. In this part of the process considerable care must be exercised, as one large particle

of glass on a sheet of fine paper would scratch the work upon which it was used and would produce an uneven surface.

The placing of glass on paper requires considerable skill and experience, says Woodworkers' Review. The workman has delivered to him plain papers in reams of 120 sheets, each sheet making four sheets of ordinary size. The appliances used are a copper tank holding 56 lb. of glue, a table, a a bench on which the sheets are laid to cover them, with a cutting machine and a press for packing and tying glass, a hot plate for firing the sheets, and a drying room.

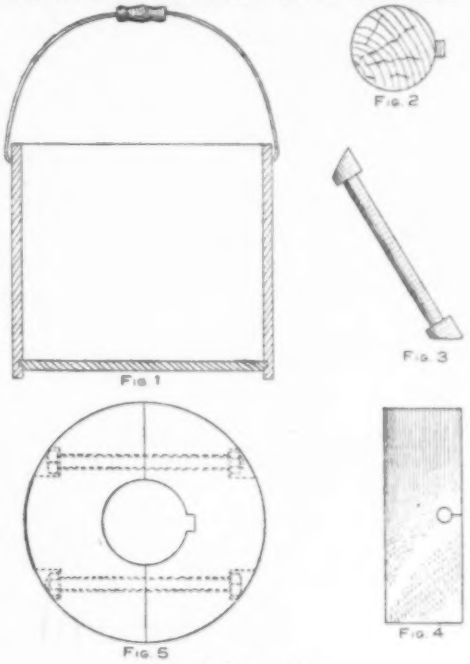
A ream or two of paper is placed on the table and the top sheet is coated with glue by means of a brush resembling a shoe brush, but with longer hair. The sheet is lifted by two corners and laid on the bench, glue side uppermost; the bench has a border standing up some 7 or 8 in. high on three sides, with a narrow fillet in front. Powdered glass is simply thrown or scraped over the sheet, which then is raised from one side so that the superfluous glass runs off on to the bench and is used again. The sheet is then placed on the hot plate, a hollow, flat, iron bench heated with steam; this causes the glue to boil up and thus securely fixes the particles of glass on the paper. All this is done much more quickly than it can be described.

After drying, the sheets are cut up and arranged in quires and reams, ready for the market. Glasspaper has entirely replaced the old-fashioned sandpaper. This was made in the same way as glasspaper except that sharp, fine sand instead of glass was used. Custom, however, has perpetuated the name of sandpaper, and we hear but seldom the name "glasspaper."

¶Do not draw the hairs of a painter's pencil through the fingers as it will curl them out of shape. Roll the quill between the palms of the hands. This will cause the hair to spread out and reveal any defects.

How to Make a Cement Split Pulley

We had occasion to use a pulley on a 4-in. line shaft and we could not get one with a 4-in. hole. As it was neces-



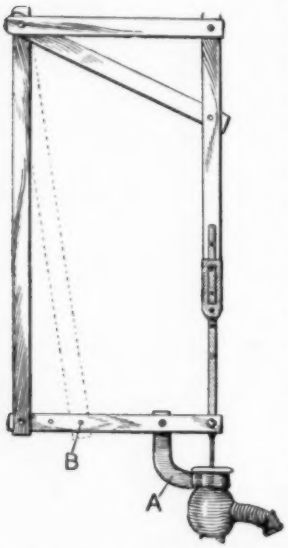
Pail Used as a Form

sary to have a pulley immediately, we set about to make one of cement. A straight-sided candy pail, as shown in Fig. 1, made a convenient form of the right size for the diameter of the pulley. The hole for the 4-in. shaft was made with a wood core, as shown in Fig. 2, to which was attached a strip of wood the same size as the key. Two round pieces of wood with blocks attached to their ends, as shown in Fig. 3, were used as cores to make holes for the bolts. These cores were bored out after the cement had set. Two pieces of tin, as shown in Fig. 4, were used to separate the pulley in halves.

The complete pulley is shown in Fig. 5. This temporary concrete pulley did good service for some time, until another could be supplied. A pulley made up in this manner, using a neat cement mixture and well reinforced with wire mesh will stand considerable speed.—Contributed by C. C. Brabant, Alpena, Mich.

Stroke Reducer for a Windmill Pump

The accompanying sketch shows a way to reduce the stroke of a pump rod where a windmill is used for power.



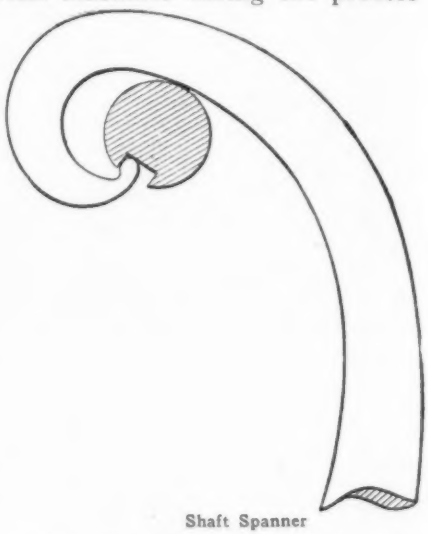
This device can be used to advantage on pumps raising water from deep wells, or where a small amount of water is to be drawn. This will also enable a wheel to run in a light wind and pump the water. The device consists of a bracket arm attached to the windmill pump rod, at the outer end of which is attached a connecting piece that operates the substitute for the pump handle. The connecting piece can be fastened at any one of the holes on the handle as at B, thus changing the stroke of the pump rod. The handle works on a fulcrum, A, and drives the pump rod in an opposite direction to the windmill rod. A sliding device is used as shown to accommodate the different movements of the two rods.—Thos. L. Parker, Olaf, Iowa.

A Detached Wheel-Turning Handle

The handle illustrated is very useful in turning wheels with spokes on which there is no projection for the hand to grasp. One of the principal uses for this handle is for turning the tailstock wheel of a lathe. Some lathes have handles attached and others are made smooth. Place the part marked A in the sketch against the spoke of a wheel and push forward as if you were cranking with a handle attached to the wheel. —Contributed by G. Crawford, Jr., Schenectady, N. Y.

A Spanner Wrench for Shafts

The accompanying sketch shows a tool that has proven itself very useful. The shape shown is the result of something like two years' experience, says a correspondent of the American Machinist. It is christened the "twister" and is used for revolving (by hand) armatures and revolving fields of electrical machines during the process of



Shaft Spanner

erection and inspection and of course, works equally well on other similar things. The need of something of the kind was strongly felt by the inspector who found the keyways on the shafts frequently damaged by the use of monkey wrenches, and pipe wrenches by erectors.

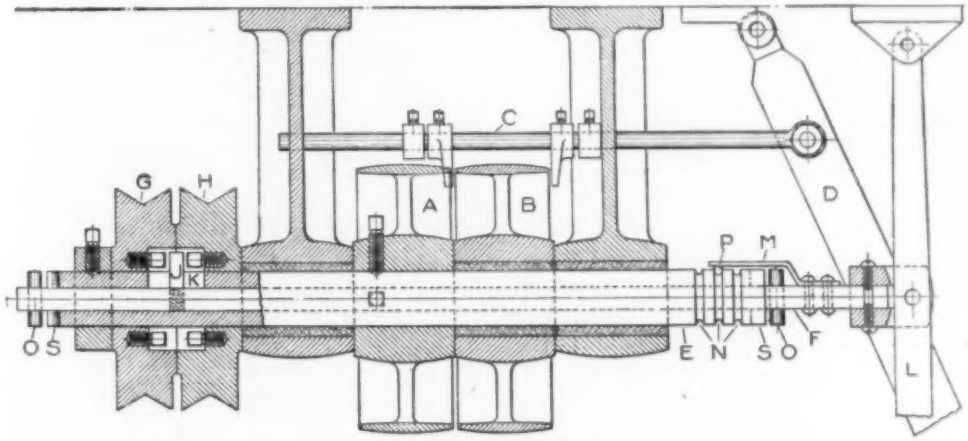
The shape given can be used in revolving shafts from 1 to 6 in. in diameter without damaging the keyway. It is made of ½ by 1-in. steel.

¶The best grinding abrasive for gas engine valves can be quickly made by pounding or grinding common glass to the consistency of wheat flour and using with water or oil.

Countershaft for Driving Two Separate Machines

Countershafts are usually made to drive only one machine, but the one shown in the accompanying sketch was designed to drive a small lathe and drill press separately. While the countershaft is very light in this instance, the design can be varied somewhat to suit the shop conditions and the size of the machines to be run.

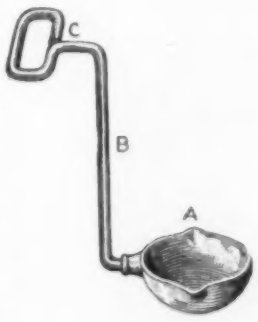
A and B are the tight and loose pulleys. The belt is moved from one to the other by means of the belt shifter, C, and the hand lever, D. The tight pulley, A, is fastened to the hollow shaft, E, by means of set screws. This hollow shaft has a smaller shaft, F, running through its center as shown. G and H are the two driving pulleys and are belted to their respective machines. The inner shaft, F, has a pin, J, fastened in it which projects through a slot, K, in the hollow shaft, E. The driving pulleys are bored out on the inside and have several set screws fastened in them as shown. When the shaft F is moved either to the right or to the left, the pin J catches on the heads of the set screws and turns the pulley. The shaft F is shifted by means of the lever L. The spring M has a small projection, P, fastened to it which drops into the grooves N and holds the shaft in the proper position. The end pins, O, are fast in the shaft F and fit into the slots S in the end of shaft E and help to bind the two shafts together. The sketch shows the pin J in the free position. The lever L has only to be shifted to the right to drive pulley H and shifted to the left to drive pulley G. This little device is very useful in small shops where the machines are small and the overhead space limited.—Contributed by Gilbert Parker, Charlestown, Mass.



Details of a Double-Driving Countershaft

Melting Babbitt in a Common Stove

The accompanying sketch shows the construction of a babbitt ladle for use in a stove. In the sketch, A represents the ladle cast with double lips for pouring from both sides; B is a wrought handle screwed in A and bent so as to reach down into the fireplace of a stove. The loop C is made broad so as to control the pouring of the metal.—Contributed by C. Purdy, Ghent, O.



A Pocket Rule Holder

The mechanic is often annoyed by having a rule slip from his pocket when bending or stooping over, and many times this will cause the loss of a good

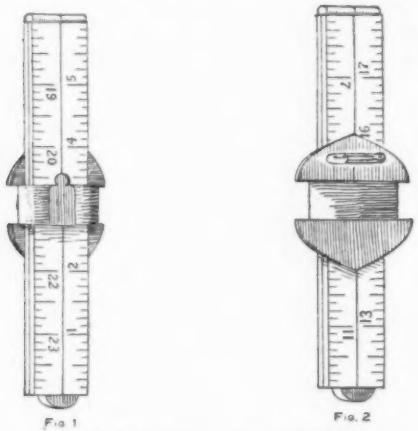


Fig. 1 Fig. 2

Rule in the Sheet-Metal Holder

rule. When a rule is carried in any other pocket except the special rule pocket in the trousers it should be protected with some kind of a holder. Such a holder as shown in Fig. 1 can be made, from a piece of heavy sheet tin or brass. A safety-pin is soldered on the upper side of the back (Fig. 2) and a piece of elastic, ¾ in. wide, is placed around the plate in the slots, and the rule is placed between the plate and elastic. There is just enough friction to hold the rule firmly. Sew a piece of leather or fasten a piece of metal on the top side of the elastic to stretch same for inserting the rule.—Contributed by E. E. Stanton, Huntington, Massachusetts.

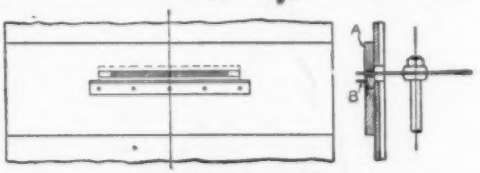
Stretching a Tight Fitting Shoe

A new shoe does not always fit the foot and when a stretcher is not at hand the following method will do equally as well: Place your foot on a 1-in. board, draw an outline of the foot, and saw out the pattern with a turning saw. Cut this out the same as a last and round off the corners so it may be used for either shoe. Round off the ends of some sticks that are ⅜ by ¾ in. and about 1 ft. long and drive them in on top of the last. Put in as many sticks as possible and wet the leather. Allow the shoe to stand over night with this last applied and usually the leather will be stretched enough to fit the foot nicely. A second operation may be necessary.—Contributed by J. A. Johnson, Walla Walla, Washington.

How to Dovetail on a Rip Saw

The small jobbing shop is sometimes called upon to turn out dovetailed work, and as these jobs are few it does not pay to have a dovetailing machine. A rip saw is one machine any small shop must have and dovetailed work can be done on it providing a device is supplied to the saw table top as illustrated.

Clamp or screw a board (A), about 12 in. wide and of suitable length, to the table top. Run the saw up through this board so that it projects above about ⅜ in. A brass angle (B) is set in the board with the one leg projecting above about $\frac{5}{16}$ in. This angle leg should be a trifle thinner than the width of the saw cut and placed the same distance away from the saw. The holes for the screws in the angle leg can be slotted to regulate this distance. Patterns, for rings with only one layer of segments, dovetailed on this machine, will be found to be very strong. The operator first holds the piece against the angle leg and cuts the first slot by pushing the wood on

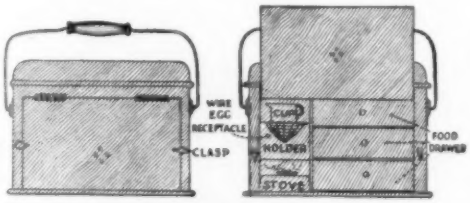


Dovetailing Saw Gauge

the saw, then the saw cut is placed over the leg of the guide and the next one cut on the saw and so on. Boxes and many other articles may be dovetailed in this manner.—Contributed by E. W. Mason, Minneapolis, Minn.

Cold Weather Lunch Pail

The use of the pail illustrated in the accompanying sketch makes it possible for a workman to have a warm lunch at the noon hour. Anyone knowing how to handle sheet tin can make this pail, or you may have it made by a tinner. The contents are taken from the side instead of the top as in the ordinary kind. A door is provided with hinges at the top and clasps at the ends. The interior is divided into two parts, one for food drawers and the other for coffee. The coffee holder is supplied with a cup to keep the liquid from splashing over. At the top of the holder is a wire mesh shaped like a cup where an egg can be placed without its dropping to the bottom of the liquid. Below the coffee holder is a



Cold Weather Lunch Pail

common alcohol lamp or stove which can be lighted in time to have the entire lunch warm by noon time.—Contributed by W. A. Jaquith, Richmond, California.

Temporary Repair on an Automobile Tire

When you are out on a trip with your automobile and get caught with a blow-out and with no spare covers on hand and you are a good many miles from a place to get repairs, you may possibly be obliged to try this substitute patch. If you do not have the necessary repairing material on hand, take an ordinary shirt cuff and insert it underneath the rent in the tire cover and inflate the inner tube. The cuff has the stiffness and pliability necessary to answer the purpose, and has been worked several times with gratifying success.

Holding a Barrel on a Truck

The accompanying sketch shows a chain and hooks attached to a truck for holding a barrel while transporting

Hooks in the Barrel

it from place to place. Two pieces of chain are used, one 4 ft. and the other about 2 ft. long, which are connected together with a hook to form a Y-shaped figure. Two hooks are made like the one shown in Fig. 1 and attached to the two shorter ends of the chains. These are hooked into the barrel just below the first hoop as shown. The other end of the chain is fastened to a bar placed behind the standards of the truck.—Contributed by W. Armstrong, Springfield, O.

A Close-Fitting Caliper Joint

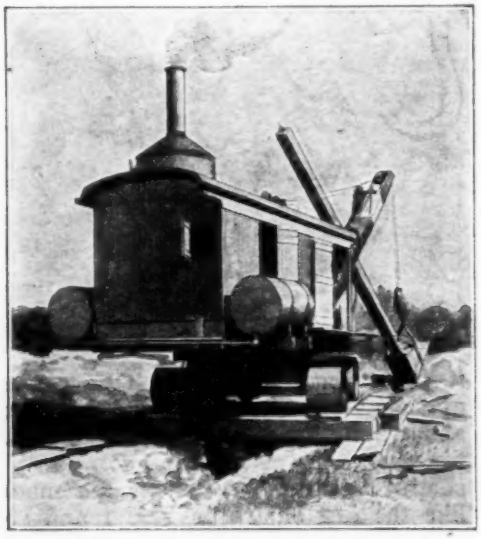
A caliper joint that will always work snug and be properly lubricated is shown in the sketch. The caps or washers, AA, are made concave as shown at BB between the rivet C and the outer edge of the disk. The concavity is filled with beeswax before the

Joint Filled with Beeswax

parts are put together and riveted. The rivet C can be quite large, and after it is riveted down, a hole, D, is bored through the center.—Contributed by C. Purdy, Ghent, O.

Digging and Filling Trenches with a Steam Shovel

The accompanying illustration shows a 35-ton revolving steam shovel digging a ditch 4 ft. wide and from 10 to



Tile Ditching with a Steam Shovel

14 ft. deep, and at the same time filling the trench behind, while the tile are being laid beneath the machine. The back filling is accomplished by excavating in front, swinging through a half circle and depositing the material in the trench after the tile has been laid.

Fighting Mine Fires with Sulphur Dioxide

Stubborn mine fires have been quenched by producing an atmosphere in which combustion cannot be sustained. Carbon dioxide has been tried with a fair degree of success to produce this atmosphere. The cost of producing carbon dioxide and the danger of forming carbon monoxides make a decided drawback to the use of this method. Sulphur dioxide is more efficient than carbon dioxide in putting out a fire, yet it has not been tried out in combating mine fires. No combustible material can possibly burn in an atmosphere containing any considerable quantity of sulphur dioxide. Sulphur dioxide is very heavy, being almost twice as heavy as carbon dioxide and this heavier weight of the sulphur dioxide is an element which leads to increased efficiency, since the readiness at which the air present in the interstices of a pile of burning coal will be displaced by any inert gas is dependent upon the density of the gas. Another important effect of the greater density of sulphur dioxide is that its cooling effect upon a bed of incandescent coal is greater, volume for volume, than would be the case with a less dense gas.

Sulphur dioxide is much less dangerous than carbon dioxide as no explosive lower oxides can be produced in the reduction. Another danger of carbon dioxide is that men will get into the gas without knowing it and suffocate, where if sulphur dioxide is used, the strong odor gives instant warning when a fraction of 1% of the gas is in the air. This odor also makes it possible to locate any leakage, which can be immediately stopped before a great amount of gas has escaped.

The extremely simple manner in which sulphur dioxide can be produced, the cheapness of the method, and the efficiency of the gas in putting out fires, seem to make this a desirable means of combating mine fires. The safety of the method, its convenience, and its utility in showing fissures, which allow the escape of gas and ingress of air, are also strong points in its favor.

A Chisel for Squaring the Ends of Mortises

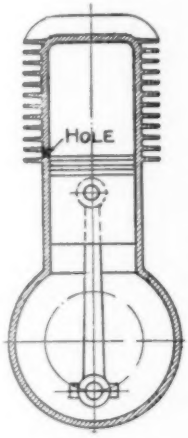
Take an ordinary socket chisel and grind the edge a little concave, as shown in the illustration. This will

For Cutting Corners Square

make it easy to cut the bottom ends of mortises square, as well as squaring the sides.—Contributed by C. Purdy, Ghent, O.

Increasing the Power of a Motorcycle Engine

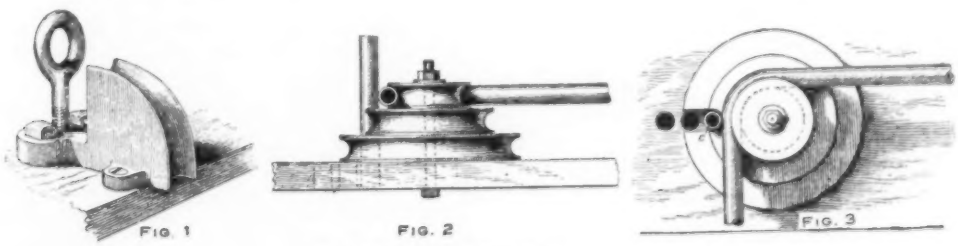
Most motorcycle engines are designed with the exhaust outlet too small to work efficiently. This fault can be overcome if a hole is bored as shown in the illustration. Bore the hole in the cylinder casing so that the piston just uncovers it at the bottom of the stroke. This allows a part of the burnt gases to escape, making less work for the engine to expel them at the exhaust port. There is little, if any, gas escapes on the induction stroke as the gas is not under pressure until the piston has started on the return stroke and has closed the hole. The burnt gases, however, being under pressure, rush out of the hole as soon as it is uncovered by the piston on the power stroke. A ¾-in. hole is about the right size. A muffler can be attached if desired, but it will decrease the efficiency of the hole.—Contributed by A. H. Ashton, Pomeroy, Ia.



Pipe-Bending Tools

Two forms of bending tools which are applicable for bending welded butt-jointed and seamless tubing are shown in the illustrations. A simple tool for bending quarter turns is shown in Fig. 1. This tool is forged from a piece of steel and fitted with an eye-bolt at the back to hold the pipe while making the bend.

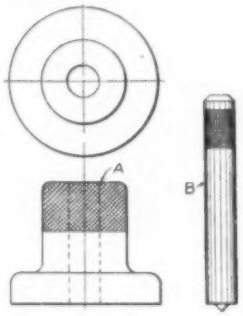
In Fig. 2 is shown the side and Fig. 3 the top view of a bending tool made from old pulleys, which are bolted together on a bench or plate. The pulleys are cut on one side to clear the holes in the bench for the catch pins. Different sized bends can be made around the pulleys. Do not forget that the pipe must be filled with sand before making the bend. When bending pipe in spirals or continuously, fill the pipe with lead and melt it out after the bend is made. Brass and copper tubing should be filled with rosin before making the bend.



Two Ways of Bending Pipe

Tool for Enlarging Center Punch Marks

In laying out a series of holes it is a difficult task to make a punch mark large enough to start a drill and also keep it central with the laying out lines. This is especially true when the holes are so small that they cannot be laid out by drawing a circle with a divider.

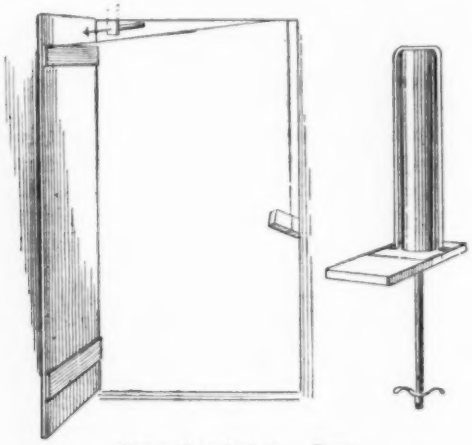


The accompanying sketch shows a simple little tool for enlarging the center mark and also keeping it exactly central. Locate your center by making a very small dot with a prick punch or scriber. Now place the punch B in

the holder A letting it extend through far enough so you can see when the point is centered on the small prick punch mark. Drop the holder A until the base lies flat upon the work and while holding it securely hit the punch B a blow with a hammer. This will enlarge the center mark and also keep it central with the first one.—Contributed by Chas. E. Klink, Lemoyne, Pa.

A Barn Door Check

An old bicycle pump that is no longer of use as a tire inflator will make a good door check. The vent is almost



Pump Attached to a Door

closed with a piece of paper or wood so that the air confined will pass out slowly, thus holding the door in check. The pump is held in position with a strip of leather or canvas attached to a piece of tin which is fastened to the door frame. The end of the plunger is tied to the top of the door.—Contributed by Thos. De Loof, Grand Rapids, Mich.

Mission Stains

What is mission oak stain? There are many on the market, with hardly two alike in tone. The true mission oak stain may be said to show a dull gray, the flakes showing a reddish tint, while the grain of the wood will be almost a dead black. To produce such a stain take 1 lb. of drop black in oil and ½ oz. of rose pink in oil, adding a gill of best japan drier, thinning with three half-pints of turpentine. This will make about 1 qt. of stain. Use these proportions for a larger quantity of stain. Strain it through cheesecloth. Japan colors will give a quicker drying stain than that made with oil colors, and in this case, omit the japan and add a little varnish to bind it.

One of the most popular of all the fancy oaks has been that known as Flemish, and this in spite of its very somber color, says Wood Craft. There are several ways of producing Flemish finish; you can fill the wood with a paste filler stained with raw umber, and when dry apply a stain of transparent flat raw umber, and for the darker shades of finish use drop black with the umber. Varnish and rub down.

According to a foreign technical journal, French workmen mahoganize various kinds of woods by the following method: The surface of the wood to be stained is made perfectly smooth. Then it is given a coating of dilute nitric acid which is rubbed well into the wood fiber. Then it is stained with a mixture made by dissolving 1½ oz. of dragon's blood in a pint of alcohol, this solution being filtered, and then there is added to it one-third of its weight of sodium carbonate. Apply this mixture with a brush, and repeat the coats at intervals until the surface has the appearance of polished mahogany. In case the luster should fail, it may be restored by rubbing with a little raw linseed oil. The description of the process is meager, and hence he who would try it will have to experiment a little.

A good cheap mission effect for oak is to mix together equal parts of boiled linseed oil and good asphaltum varnish, and apply this to the wood with a brush; in a minute or so you may rub off surplus with a rag, and when dry give a coat of varnish. A gallon of this stain will cover about 600 sq. ft. of smooth surface.

AMATEUR MECHANICS

Trailer for a Bicycle

Instead of using a seat on the handlebars or frame of a bicycle for my little girl, I made a trailer as shown in Fig. 1 to attach to the rear axle. I made it from old bicycle parts. The handlebars, which form the back of the seat, fasten into the seat post of an old bicycle attached to the trailer axle. The trailer is attached to the rear axle of the bicycle with two arms or forks on the ends of which are two forgings, formerly used on the rear ends of a bicycle frame, brazed in, and one of the tube projections cut off from each to make a hook as shown in Fig. 2. The piece marked E shows one of these forgings or hooks in section. The original axle of the bicycle was removed and one supplied 1 5/16 in. longer, which was turned below the threads for clearance, as shown at A. A washer, D, with a hexagon hole was fitted over the regular nut, C, on the axle and filed tapering so the forging or hook, E, on the trailer attachment could be kept in position. The washer F is held tightly against the hook by a pressure from a spring, G. The spring is held in place by a small nut, H, and cotter pin, I. This attachment makes a flexible joint for turning corners. When turning from right to left the left hook on the trailer forks stays in position, while the right hook pushes the washer F outward and relieves the strain on the fork. This attachment also makes it easy to remove the trailer from the bicycle. The washers F are pushed outward and the hook raised off the axle.—Contributed by John F. Grieves, Providence, R. I.

Fig. 2—The Hook in Position

Fig. 1—Trailer Attached to a Bicycle

A Window Lock

Bore a hole through the sash of the lower window and halfway through the sash of the upper window where they meet in the center and insert a heavy nail or spike. This will fasten the sash together so well that nothing short of a crowbar can pry them apart. The nail can be easily removed when the windows are to be opened.

How to Make a Sewing Bag

A very practical and novel sewing bag for odds and ends necessary for mending, etc., can be made of a folding camp stool. If an old stool is not

Fig. 1 Fig. 2.

Camp-Stool Work Bag

at hand, a new one can be purchased for 25 cents. Remove the top or seat, which is usually made of a piece of carpet, then make a bag as shown in Fig. 1 and stitch a heavy cord around the top to make it strong. Make pockets on the inside as shown and nail the bag to the two crosspieces on which the ends of the carpet were tacked. Large, brass furniture nails should be used. Attach a small hook and eye on each end and fasten two leather handles to the crosspieces.

Such a bag requires little room when folded and can be stored in a closet when not in use.—Contributed by Joseph Ledwinka, Philadelphia, Pa.

Home-Made Roller Skates

The rubber-tired wheels of an old carpet sweeper can be used to advantage in making a pair of roller skates. In Fig. 1 is shown how an iron washer or two may be fastened to the wood with a piece of sheet metal to support

Fig. 1 Fig. 2

Rubber Tired Roller Skate

the short axles of the wheels. The wheels are oiled through the holes A and B, Fig. 2. These holes should be smaller than the axles. The two side pieces are fastened together with a board nailed on the top edges, as shown. This board also furnishes the flat top for the shoe sole. Two straps are attached for fastening the skate to the shoe.—Contributed by Thos. De Loof, Grand Rapids, Mich.

Adjuster for Flexible Electric Wires

The accompanying illustration shows an adjuster for changing the drop of an electric light. The main feature of this adjuster is that it can be removed from the cord at any time. The adjuster is made from a piece of wood, ⅜ in. thick, 2 in. wide and 3 in. long. A ¼-in. hole is bored in the center near each end of the wood and a slot cut from

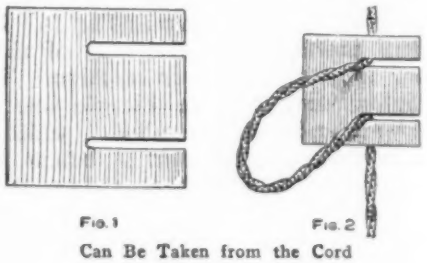


Fig. 1 Fig. 2

Can Be Taken from the Cord

the holes to the outside edge, as shown in Fig. 1. It is attached to the flexible cord as shown in Fig. 2.—Contributed by J. J. Voelcker, Decatur, Ill.

Making Photographs on Watch Dials

Beat to a foam the white of an egg, with the addition of a little ammonia. Add 9 oz. and 3 dr. of water and beat again. After the egg has settled, filter and let the liquid run over the dial, which has been previously cleaned with ammonia. When the surplus has run off, coat with the mixture and allow to dry.

A sensitive collodion is now produced as follows: Dissolve 9 gr. of chloride of zinc in 5 dr. of alcohol; add 7½ gr. of collodion cotton and 6½ dr. of ether. Shake the whole forcibly.

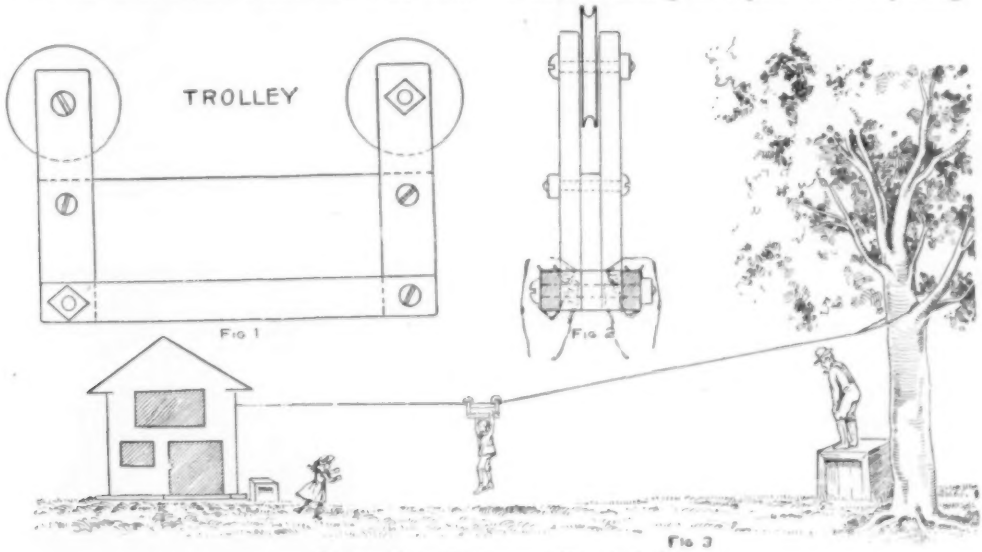
Dissolve 23 gr. of nitrate of silver in hot water, add 1½ dr. of alcohol and keep the whole solution by heating. The silver solution is now added in small quantities at a time to the collodion, which must be well settled. This, of course, is done in the dark room. After 24 hours the emulsion is filtered by passing it through cotton moistened with alcohol. This durable collodion emulsion is now flowed thinly upon the prepared watch dial, which, after the collodion has coagulated, is moved up and down in distilled water until the fatty stripes disappear. The water is then changed once, and after a short immersion, the dial is left to dry on a piece of blotting paper. It is now ready for exposure. Expose under magnesium light and develop with a citrate oxalic developer, or in the following hydroquinone developer:

Hydroquinone	1 dr.
Bromide of potassium	6 dr.
Sulphite of soda	1½ oz.
Carbonate of soda	2 2/3 dr.
Water	14 oz.

After fixing and drying, coat with a transparent positive varnish.

Home-Made Overhead Trolley Coaster

The accompanying sketch shows a playground trolley line which furnished a great deal of amusement to many children at a minimum cost. The wire, which is 3/16 in. in diameter, was stretched between a tree and a barn across a vacant quarter block. The strength of the wire was first tested by a heavy man. When not in use the wire is unhooked from the tree and hauled into the barn and coiled loosely in the hay loft. The wire was made taut for use by a rope which was fastened to the beams in the barn. The trolley was made, as shown in Figs. 1 and 2, of strips of wood bolted with stove bolts on two grooved pulleys. The middle wide board was made of hardwood. The wheels were taken from light pulley blocks and stove bolts were purchased from a local hardware store to accurately fit the hubs. As it was necessary to keep the bearings greased, we used vaseline. This coaster made great sport for the youngsters and at no time were they in danger of a serious fall as the line was hung low and the slant of the wire was moderate.—Contributed by H. J. Holden, Palm Springs, Calif.



Details of the Trolley and How It Is Used

How to Construct an Annunciator

Oftentimes a single electric bell may be connected in a circuit so that it can be operated from more than one push button. These push buttons are usually located in entirely different parts of the building and it is necessary to have some means of determining the particular push button that was pressed and caused the bell to operate. The electric annunciator is a device that will indicate or record the various calls or signals that may be sent over the circuits to which the annunciator is connected. A very simple and inexpensive annunciator may be made in the following way:

Before taking up the construction of the annunciator it would be best to make a diagrammatic drawing of the circuit in which the annunciator is to operate. The simplest circuit that will require an annunciator is one where the bell may be operated from either of two push buttons. In this case the annunciator must be constructed to give only two indications. Fig. 1 shows how the various elements of such a circuit may be connected. B is an ordinary vibrating electric bell, M1 and M2 are the two electromagnets of the annunciator, A is a battery of several dry cells, and P1 and P2 are the push buttons from either of which the bell may be operated.

When the push button P1 is pressed the circuit is completed through the winding of the magnet M1 and its core becomes magnetized. In a similar manner the core of the magnet M2 becomes magnetized when the push button P2 is pressed and the circuit completed through the winding of the magnet M2.

If an iron armature, that is supported by a shaft through its center and properly balanced, be placed near the ends of the cores of M1 and M2, as shown in Fig. 2, it may assume the position indicated by either the full or dotted lines, depending upon which of the magnets, M1 or M2, was last magnetized. The position of this armature will serve to indicate the push button from which the bell was operated. The magnets should be placed inside a case and the indication may be made by a pointer attached to the shaft, supporting the armature.

If you are able to secure the electromagnets from a discarded electric bell they will work fine for the magnets M1 and M2. They should be disconnected from their iron support and mounted upon some non-magnetic material, such as brass or copper, making the distance between their centers as small as possible. The piece of metal upon which the magnets are mounted should now be fastened, by means of two wood screws, to the back of the board, shown in Fig. 6, that is to form the face of the annunciator. It should be about ⅛ in. thick, ½ in. wide and long enough to extend a short distance beyond the cores of the magnets M1 and M2. Drill a 1/16-in. hole through its center, as shown in Fig. 2. Drive a piece of steel rod into this hole, making sure the rod will not turn easily in the opening, and allow about ½ in. of the rod to project on one side, and 1½ in. on the other side.

Drill a hole in the board upon which the magnets are mounted so that when the long end of the rod carrying the armature is passed through the hole, the armature will be a little more than 1/16 in. from each magnet core. The short end of the rod should be supported by means of a piece of strip brass bent into the form shown in Fig. 3.

Drill a hole in the center of this piece, so the rod will pass through it. When the armature has been put in its proper place, fasten this strip to the board with two small wood screws. You may experience some difficulty in locating the hole in the board for the rod, and it no doubt would be best to drill this hole first and fasten the magnets in place afterwards.

Two small collars should be fastened to the rod to prevent its moving end-

wise. Fit the collars tightly on the rod to hold them in place.

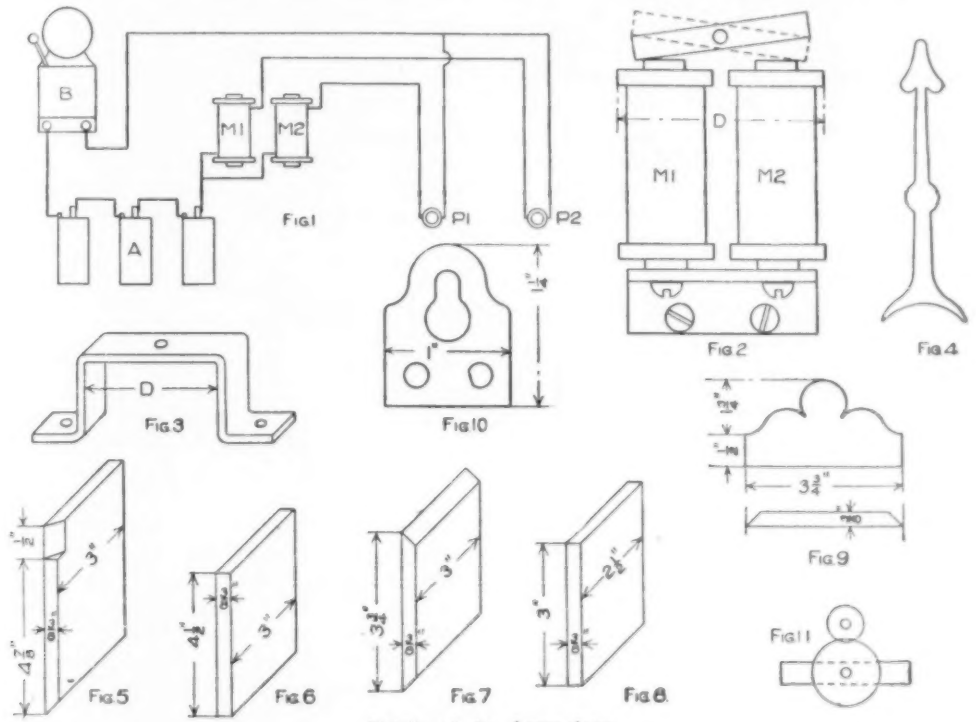
Cut the long end of the rod off so it projects through the face of the annunciator about 3/8 in. Take some very thin sheet brass and cut out a needle or indicator as shown in Fig. 4. In a small piece of brass drill a hole so it will fit tight on the other end of the rod. Solder the indicator to this piece and force it in place on the end of the rod.

When the armature is the same distance from each core, the indicator should be parallel to the long dimension of the face of the case. The case of the instrument may be made in the following way:

Secure a piece of 3/8-in. oak, or other hard wood, 3 in. wide and 2½ ft. long. Then cut from this board the following pieces: two whose dimensions correspond to those of Fig. 5 and are to form the sides of the case; two whose dimensions correspond to those of Fig. 6 and are to form the back and the face of the case; three whose dimensions correspond to those of Figs. 7, 8, and 9 and are to form the lower and upper end of the case and the finish for the top.

Secure a piece of window glass, 4½ in. by 3⅛ in. that is to be used as the front. Before assembling the case cut on the inner surface of the pieces forming the sides and the lower end, a groove just wide enough to take the glass and 1/16 in. in depth. The outer edge of this groove should be 3/8 in. from the outer edge of the frame. After the case is fastened together there should be a slot between the piece forming the upper end and the piece that serves as a finish at the top, that will allow the glass to be slipped into place. A small strip of wood should be tacked over this slot, after the glass is put in place, to prevent the dust and dirt from falling down inside of the case.

The piece upon which the works are to be mounted may be fastened in place



Details of the Annunciator

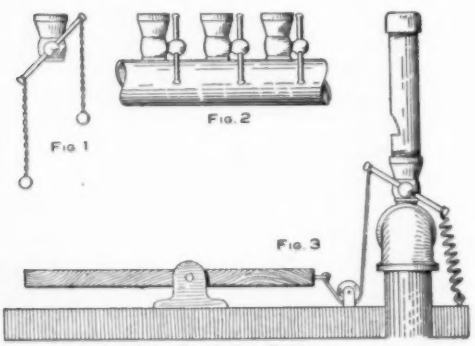
by means of four round-headed brass screws that pass through the sides of the case. It should be fastened about ½ in. back of the glass front. The back may be fastened inside of the case in a similar manner.

Cut two pieces, from some sheet brass, whose dimensions correspond to those of Fig. 10. These pieces are to be used in supporting the case by means of some small screws. Fasten three binding-posts, that are to form the terminals of the annunciator, on the top of the upper end of the case. Mark one of these binding-posts C and the other two L1 and L2. Connect one terminal of each of the magnet windings to the post marked C and the other terminal to the posts L1 and L2. You can finish the case in any style you may desire. Oftentimes it is desirable to have it correspond to the finish of the woodwork of the room in which it is to be placed. The distance the point of the indicator will move through depends upon the distance between the cores of the magnets and the distance of the armature from these cores. These distances are oftentimes such that the indications of the cell are not very definite. If the armature is moved too far from the cores there is not sufficient pull exerted by them when magnetized, to cause the position of the armature to change.

Mount on the shaft carrying the armature a small gear wheel. Arrange another smaller gear to engage this on and fasten the indicator to the shaft of the smaller gear. Any movement now of the armature shaft will result in a relative large movement of the indicator shaft. Figure 11 shows the arrangement of the gears just described.

How to Make a Steam Calliope

Secure ten gas jet valves, the part of the gas fixture shown in Fig. 1, and prepare to place them in a piece of 1-in. pipe, 12 in. long. This is done by drilling and tapping 10 holes, each



Details of the Calliope

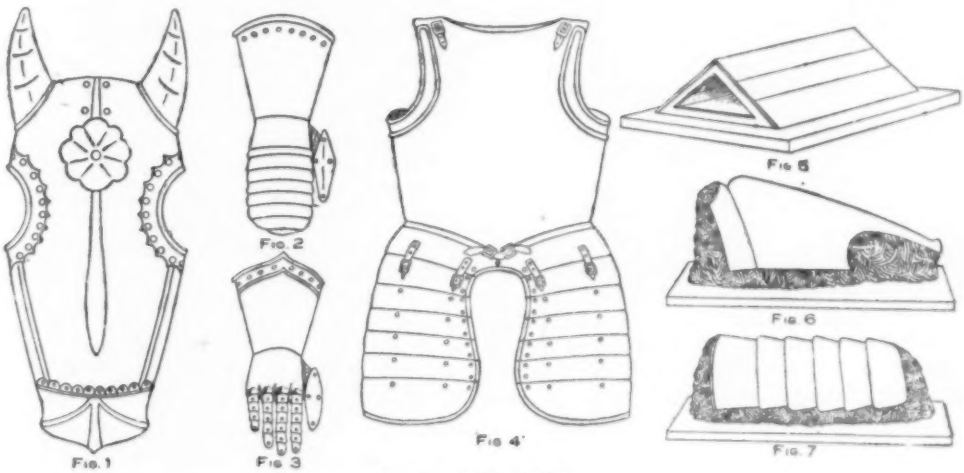
1 in. apart, in a straight line along the pipe. The valves screwed into these holes appear as shown in Fig. 2. The whistles are made from pipe of a diameter that will fit the valves. No dimensions can be given for the exact lengths of these pipes as they must be tried out to get the tone. Cut ten pieces of this pipe, each one of a different length, similar to the pipes on a pipe organ. Cut a thread on both ends, put a cap on the end intended for the top, and fit a plug in the other end. The plug must have a small portion of its side filed out, and a notch cut in the side of the pipe with its horizontal edge level with the top of the plug. This part of each whistle is made similar to making a bark whistle on a green stick of willow. The pipes are then screwed into the valves.

The whistles may be toned by trying out and cutting off pieces of the pipe, or by filling the top end with a little melted lead. The 1-in. pipe must have a cap screwed on one end and the other attached to a steam pipe. The steam may be supplied by using an old range boiler, placed horizontally in a fireplace made of brick or sheet iron. If such a boiler is used, a small safety valve should be attached. The keys and valve operation are shown in Fig. 3. This is so plainly illustrated that it needs no explanation.—Contributed by Herbert Hahn, Chicago.

Imitation Arms and Armor—Part VI

A mass of any kind of clay that is easily modeled and fairly stiff must be prepared and kept moist and well kneaded for making the models over which paper is formed to make the shape of the articles illustrated in these sketches. A modeling board must be made of one large board or several pieces joined closely together upon which to work the clay, says the English Mechanic, London. The size of the board depends upon the size of the work to be made.

torn in irregular shapes to the size of the palm of the hand and put to soak in a basin of water in which a tablespoonful of size has been dissolved. If size cannot be obtained from your local painter, a weak solution of glue will do equally well. All being ready, and the clay model oiled, take up one piece of paper at a time and very carefully place it on the surface of the model, pressing it on well and into and around any crevices and patterns. Continue this operation until the clay



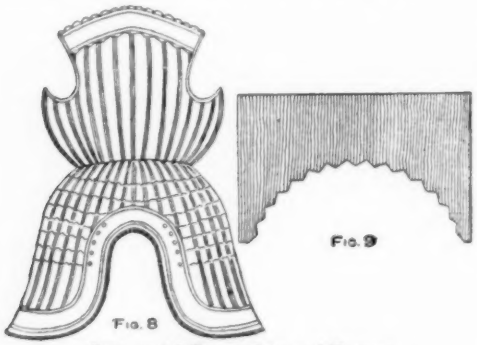
Armor and Clay Models

An open chamfron of the fifteenth century is shown in Fig. 1. This piece of horse armor, which was used in front of a horse's head, makes a splendid center for a shield on which are fixed the swords, etc., and is a good piece for the amateur armorer to try his hand on in the way of modeling in clay or papier maché work. The opening for the animal to put his head into is semicircular, and the sides do not cover the jaws. As the main part of this armor is worn in front of the head the extreme depth is about 4 in. The entire head piece must be modeled in clay with the hands, after which it is covered with a thin and even coating of sweet or pure olive oil. A day before making the clay model some pieces of thin, brown wrapping paper are

model is completely covered on every part. This being done, give the paper a thin and even coating of glue, which must be quite hot and laid on as quickly as possible. Lay on a second layer of paper as carefully as before, then another coat of glue, and so on until there are five or six coats of glue and paper. When this is dry it will be strong enough for all ornamental purposes. The ragged edges of the paper are trimmed off with a sharp knife and the whole surface smoothed with fine sandpaper. Then carefully glue on sections of tinfoil to give the armor the appearance of steel. The armor is now removed from the model.

A mitten gauntlet of the fifteenth century is shown in Fig. 2. This can be made in one piece, with the ex-

ception of the thumb shield, which is separate. The thumb shield is attached to the thumb of an old glove which is fastened with round headed nails on the inside of the gauntlet.



Corrugated Breastplate and Former

The part covering the wrist is a circular piece, but the back is not necessary as it would not be seen when the gauntlet is hanging in its place.

In Fig. 3 is shown a gauntlet of the seventeenth century with separately articulated fingers. This gauntlet may be molded in one piece, except the thumb and fingers, which must be made separately and fastened with the thumb shield to the leather glove that is attached to the inside of the gauntlet, the same as in Fig. 2.

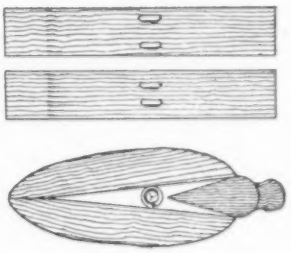
A breastplate and tassets of the sixteenth century are shown in Fig. 4. The tassets are separate and attached to the front plate with straps and buckles, as shown in the sketch. There is a belt around the waist which helps to hold the back plate on. Attached to the back of the plate would be two short straps at the shoulder. These are passed through the buckles shown at the top right and left-hand corners of the front plate. For decorative purposes the back plate need not be made, and therefore it is not described. The method of making armor is the same as of making helmets, but as larger pieces are formed it is well to use less clay owing to the bulk and weight.

An arrangement is shown in Fig. 5 to reduce the amount of clay used. This triangular-shaped support, which can be made in any size, is placed on the modeling board or bench and covered with clay. This will make the model light and easy to move around, and will require less clay. It is not necessary to have smooth boards; the rougher the better, as the surface will hold the clay. The clay forms modeled up ready to receive the patches of brown paper on the surface are shown in Figs. 6 and 7.

A German fluted armor used at the beginning of the sixteenth century is shown in Fig. 8. The breastplate and tassets of this armor are supposed to be in one piece, but for convenience in making it will be found best to make them separately and then glue them together after they are taken from the model. A narrow leather belt placed around the armor will cover the joint. Fluted armor takes its name from a series of corrugated grooves, ½ in. in depth, running down the plate. A piece of board, cut into the shape shown in Fig. 9, will be very useful for marking out the fluted lines.

Home-Made Hand Vise

A vise for holding small articles while filing can be made as shown in the illustration. The vise consists of three pieces of wood, two for the jaws and one a wedge.



The hinge for connecting the two jaws is made of four small screw eyes, two in each jaw. When locating the place for the screw eyes, place the two in one jaw so they will fit between the two of the other jaw. Put a nail through the eyes when the jaws are matched together and they are ready for the wedge in clamping the article to be filed.—Contributed by John G. Buxton, Redondo Beach, Calif.

Woodworking for Beginners

By Ira S. Griffith

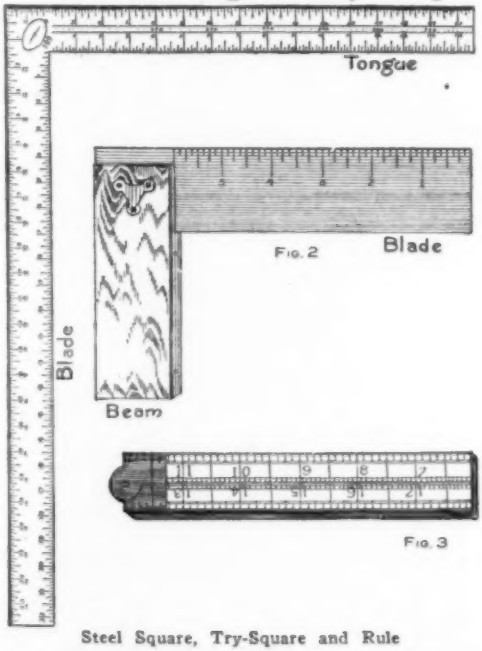
CHAPTER II

Laying Out Rough Stock

The tools needed for this are the rule, try-square or steel square, a straightedge and a pencil. Fig. 2 shows the try-square and steel or framing square, and gives the names of the parts. The rule used may be the single-piece rule or the folding 2-ft. rule, such as carpenters use, Fig. 3. A straightedge is anything which has one of its edges straight.

Directions: 1—Measure off and mark the length of the piece required. 2—Measure off near the end the width wanted. 3—At what is to become the other end of the piece, mark off the width in a manner similar to that of 2. 4—With the straightedge connect these points and draw a line through them, Fig. 4. 5—With the try-square or steel square draw a line to limit the length, Fig 5.

A second way to lay out the piece where the first edge is fairly straight



Steel Square, Try-Square and Rule

is to thumb-gauge for width. This is done as shown in Fig. 6. The pencil is held against the end of the rule and the whole is pulled toward the worker.

Fig 4

Making a Straightedge Line

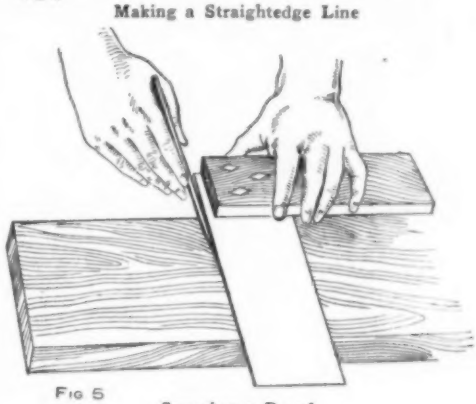


Fig 5

Squaring a Board

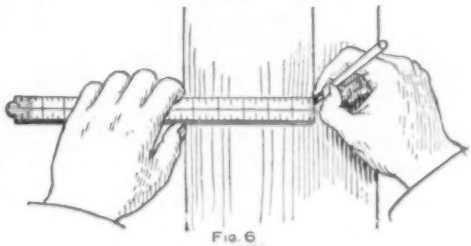


Fig. 6

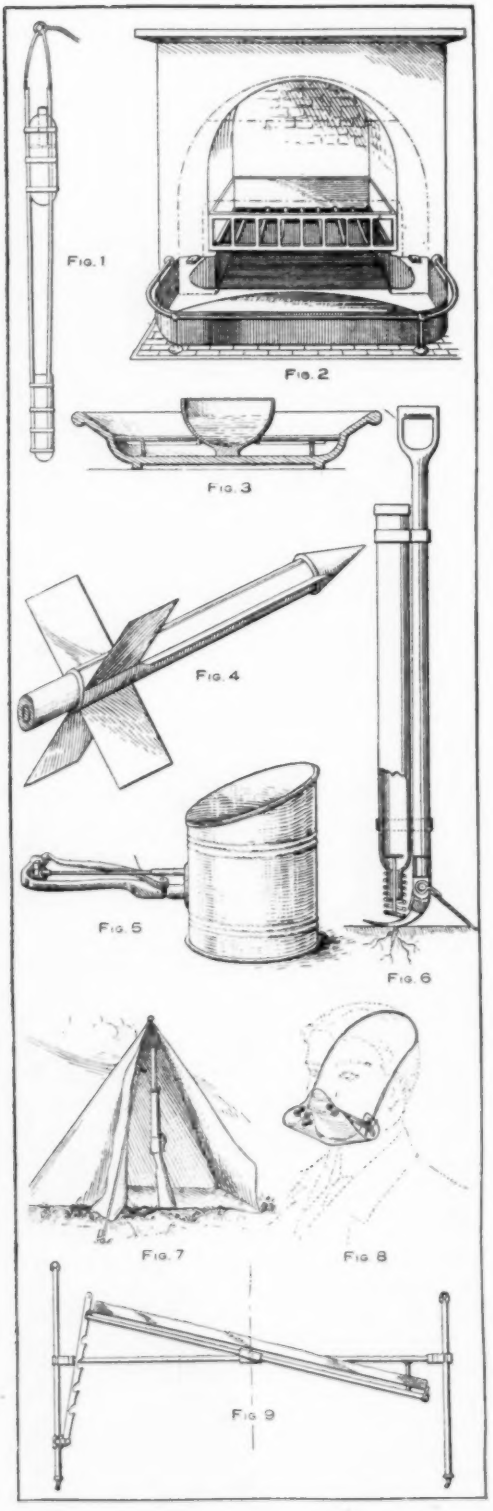
"Thumb" Gauge

The thumb nail of the left hand held on the rule at the desired point acts as a gauge head.

(To be continued)

Turpentine in Cutting Oil

When cutting steel or wrought iron in a lathe, milling machine, drill press or planer, it is sometimes necessary to leave a smooth surface. Oil, or various cutting compounds of oil, is used for this purpose and to keep the surface cool. If a little turpentine is added to the oil, it will greatly assist in leaving a smooth surface. A proportion of one-quarter turpentine is good.



INTERESTING IDEAS

FLOATING AND LUMINOUS LINE-CARRYING ROCKET.—The rocket shown in Fig. 1 is designed to carry a line from a ship in distress to a lifeboat or another ship. It consists of an ordinary metallic rocket with a cork float, and a small cylinder divided into two compartments containing calcium carbide and phosphide. Should the rocket fall short of the mark towards which it is discharged, or strike the water ahead or astern, the cork keeps it afloat and the calcium flame makes it easy to locate.

COMBINED ASH-PAN AND BLOWER.—This combined ash-pan and blower (Fig. 2) keeps ashes and dust from flying around the room and can completely close the opening of the arch of the fireplace when desired. One section of it slides under the grate, where it receives the ashes, and the other part extends out over the hearth, where it catches and retains the fine particles of ash that otherwise might be blown out into the room. The hinged cover of this section may be turned up against the opening of the fireplace, completely closing it.

INGENIOUS OYSTER DISH.—Figure 3 is a dish for the serving of oysters. The bowl-like receptacle rising up from the center of the plates is filled with ice in which the oysters are packed. Vinegar, salt, pepper, or any of the other relishes usually served with oysters do not go well with ice, and this is the reason for the special plate. The oysters are removed from the ice and placed on the plate one at a time, where they are salted, peppered, or sprinkled with vinegar before eating.

AERIAL PROJECTILE.—The aerial projectile shown in Fig. 4 looks very much like the head of an ordinary sky-rocket provided with flanges along its entire length and steering planes near its base. The body is hollow, and the cap is presumably filled with an explosive which will do damage when it comes in contact with the gas bag of a dirigible.

FLOUR-SIFTER OPERATED WITH ONE HAND.—Fig. 5 is a flour sifter that can be operated by one hand while the other is occupied with stirring the batter. The agitator is made of one wire, bent in such a manner that there are only three wires that cross the sieve, three wires over and three wires back. The sifter is said to work with such facility and exactness that the flour can be shaken into a tea-cup, instead of all over the flour board and floor.

WEED-DESTROYER.—At the end, or bottom, of the handle forming the weed-destroyer shown in Fig. 6 is a pivotally-mounted blade for severing the weed close to the roots, and a brace that engages with the ground. When the handle is pushed downward this brace projects the blade forward under the weed, severing it from the root. At the same time a destroying fluid is ejected onto the severed root from the containing cylinder fastened along the handle. The valve of the fluid cylinder is opened and closed by means of a spring, which is compressed when downward pressure is exerted on the handle.

TENT SUPPORTED BY GUN.—The small tent shown in Fig. 7 is designed for army use or for hunters. The canvas rolls up into a small pack that can be carried on the back, and all else required is a few yards of light rope and several pegs. The gun carried by the soldier or hunter is the support. A cap, sewn in the top of the tent and provided with a bayonet, engages with the muzzle of the gun.

SHIELD TO PROTECT NOSE AND MOUTH FROM DUST.—Figure 8 is a shield composed of flexible material designed to protect the nose and mouth from dust or minute particles of any kind that rise from underfoot. It fits under the chin and curves around it, rising in front of the mouth and nose. It can be used in automobile riding to protect the wearer from road dust, in grain pits, or, in fact, anywhere where disagreeable or dangerous particles are floating in the air.

A TILTING BED.—The drawing designated as No. 9 is a bed that can be tilted or inclined. A toothed

IN RECENT PATENTS

bar attached to the head of the bed-frame, and a bar of similar kind attached to one of the side frames near the base, suffice to hold the bed at the desired angle.

SHOE-SALESMAN'S STOOL.—The footrest of the shoe-salesman's stool shown in Fig. 10 is provided with side shields, the inner surfaces of which are formed of mirrors. The person having the shoe fitted can see how it looks from a side view, and the screens provide considerable privacy.

ELECTRIC SEALING-WAX MELTER.—The device shown in Fig. 11 is an electric melter for sealing wax. The tube is encompassed by an electro-thermal resistance, which heats the wax. The melted wax drops from an opening in the bottom of the tube.

TENT REQUIRES NO POLE SUPPORT.—Figure 12 illustrates a tent that requires no pole support and is erected by passing its main rope over one of the limbs of a tree. The bottom edges of the tent are first pegged to the ground, then the main rope is thrown over the limb and drawn taut. Held up by such a solid object as a tree, there is no danger of wind blowing it down, providing, of course, that the pegs are fixed solidly in the ground.

SELF-CENTERING SEWER PIPE.—Using ordinary sewer pipe, it is very difficult to connect the ends accurately so that the passage throughout the entire length of sewer or drain will be uninterrupted and uniform, but with the pipe shown in Fig. 13 there seems no possibility of one length fitting unevenly into another. The reason lies in the forming of ribs lengthwise along the pipe. These are of sufficient thickness to project beyond the outer surface of the pipe proper, thus causing self-centering when the small end of one is fitted into the socket or flanged head of the other, and at the same time leaving available space within the joint for the usual filling.

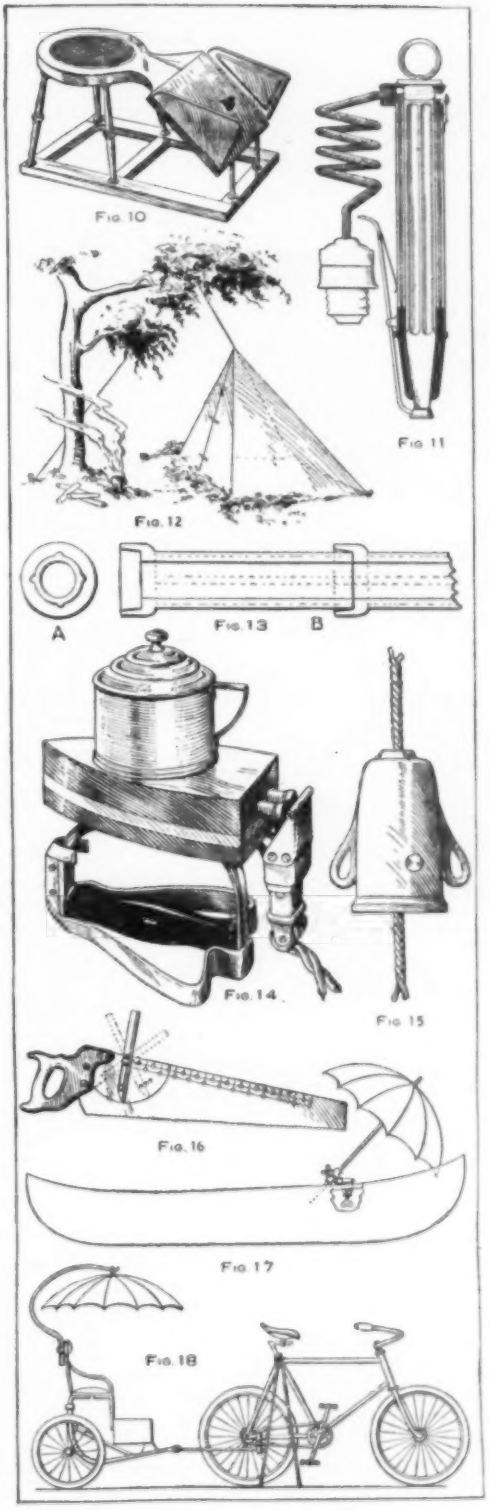
ELECTRIC FLAT-IRON CONVERTED INTO STOVE.—By providing the ordinary electric flat-iron shown in Fig. 14 with a base in which it will stand upright on its handle it is converted into an electric stove. A small kettle placed on its ironing surface when in this position will heat water, and many other like heating tasks can be performed by it.

ROPE FIRE-ESCAPE ATTACHMENT.—A rope in each room as a means of escape, should fire make descent impossible by ordinary means, is better than no fire escape at all, but hands would probably be blistered by the slide, if the person escaping did not lose hold of the rope altogether. The device designated as Fig. 15, however, robs the rope of both these dangers. It is a carrier provided with inner mechanism which engages with the rope and keeps it from sliding too fast. The person escaping, takes hold of the handles of the carrier and starts to slide, the descent being too slow to cause dizziness or land him at the bottom with an uncomfortable jolt.

COMBINED SAW, BEVEL, AND SQUARE.—Three tools in one, if none of the three interferes by getting in the way of another, makes a very satisfactory and useful article. In the last set of patents a tool was shown that combined a pocket rule, level and protractor, while this combination (Fig. 16) is a saw, bevel, and square.

UMBRELLA ATTACHMENT FOR CANOES.—Figure 17 shows the means by which an umbrella may be clamped in such a position that it will provide shade for one end of a canoe. The umbrella may be set at any angle and as high above the canoe as the length of an umbrella handle allows.

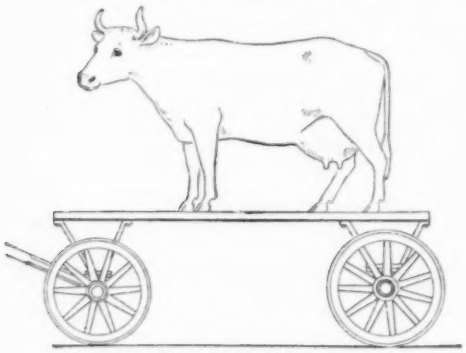
TWO-WHEELED TRAILER FOR BICYCLE OR MOTORCYCLE.—This curious little pneumatic-wheeled trailer (Fig. 18) may be attached to either a bicycle or motorcycle when the rider desires to have a child accompany him. If the speed is not excessive, and the rider on the bicycle or motorcycle is careful in turning corners, the trailer, provided with a sunshade, is an ideal vehicle for the purpose. It is attached to the bicycle by means of a bar having a universal joint.



June This Issue 251,000 15 Cents

CURIOUS PATENTS

REFRIGERATOR COW.—A curious idea for milk carts is contained in this patent, applied for in 1898. Just what it is intended for is told by the inventor himself: "My invention is a new and useful improvement in milk refrigerators and delivery apparatus, and has for its object the provision of a device that resembles a life-sized cow, in which milk

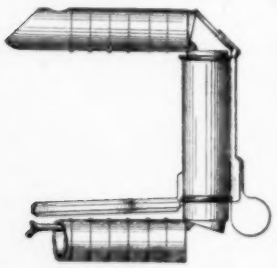


Cow Gives Ice-Cold Milk

may be stored and kept at a proper temperature, and from which it may be drawn as occasion requires after the manner of milking a cow. Within the body are receptacles or compartments, each of which is provided with a cover and adapted to contain the desired quantity of milk. By the use of two receptacles two qualities of milk may be stored at the same time, such as sweet milk and buttermilk. In the bottom of each of the receptacles is located a valve having a spring for normally holding it in place, so as to prevent the downflowing of the milk. Each of the teats has a toggle-lever connected to a lift-rod, and when the latter is raised the valve is lifted and the milk flows out of the teats. By proper manipulation of this device a realistic representation may be had of the milking of a cow.

"The portion of the body of the imitation cow not occupied by the milk receptacles is utilized for the storing of ice to maintain the milk at a proper temperature. The imitation cow stands riveted to a wagon platform and is drawn through the streets in the same manner as an ordinary milk cart."

CURIOUS FORM OF ELECTRIC LIGHT.—Early in the history of electric lighting, a patent was granted to M. C. F. Nitze, July 29, 1879, No. 218,055, for a form of electric light which was to be swallowed to illuminate the interior of the stomach and which could also be used to illuminate the interior of other cavities of the body. As shown in the illustration, it was composed of a series of jointed, tubular metal sections resembling the human wind-pipe which carried in the end an incandescent filament of platinum wire or carbon having circuit wires attached and extending out through the tube. The tube after being swallowed had its wire in the swallowed end, illuminated by the electric current, so that the operator could look through the tube and see the interior of the stomach. The tube was also susceptible of being bent at an angle, if desired, and when so bent a reflecting mirror or prism, adjusted in the angle, would reflect the image around the angle. The lamp was cooled by a circulation of water through tubes.



HOME-MAKING ON A FLORIDA KEY.—George Deming, a resident on one of the Florida Keys, gives in a letter a very interesting description of a trip by motorboat among the keys, and the experience of himself and wife in the great hurricane of October, 1909:

My wife and self, having lived in Jacksonville, Fla., for many years, decided in the fall of 1908 to buy land on one of the Florida Keys and there establish a home. We left Jacksonville on Nov. 26 in a 19-ft. motorboat and proceeded south by the inland water route, passing through canals, bayous, rivers, bays, lakes, and sounds. We arrived at our destination, Grassy Key, Dec. 8, making the trip in 12 days. The distance was 462 miles.

Many miles of this trip are through a country as wild today as it was 500 years ago, and the water is teeming with fish of many varieties, while birds of many kinds and colors fly through the tropical growth.

In making the trip, one passes through St. Augustine, the old Spanish city; Matanzas, with its old moss-covered castle; Ormond and Daytona, on the Halifax river; New Smyrna, opposite Mosquito Inlet; Titusville, at the head of Indian river; Rock Ledge, Melbourne, Fort Pierce, Palm Beach, on Lake Worth, and Miami, on Biscayne bay. Miami is 366 miles south of Jacksonville, and from it commences the great east coast extension, which is a wonder in itself. From Miami down Biscayne bay and through sounds and lakes for another 96 miles we wended our way through a picturesque stretch.

Thousands of majestic palms and Poinciana trees with red flowers surrounded us. At Jewfish creek we passed through the drawbridge of the east coast railroad. From there we crossed Blackwater Sound, thence along the keys through the great Florida bay, arriving at Grassy Key after one of the most interesting and attractive trips imaginable.

We pitched our tent close to the water on the Atlantic ocean side of the key and began the building of our future home, a pretty 2-story house. This was completed in May, 1909, and abandoning our tent abode we began to live the life of Christians again. The water surrounding the keys is as clear as crystal, and one can see many kinds of marine life by looking over the side of a boat. So clear and calm is the water under ordinary conditions that one can hardly believe that a storm will change it in a few hours to a swirl that would make the whirlpool rapids of Niagara seem like a duck pond in comparison.

When the great hurricane of October, 1909, struck us we were compelled to remain on the key. There was not a train, either freight or passenger, that passed between the key we were on and the mainland from Oct. 10 to Nov. 8. More than 150 boats of various sizes were destroyed, most of them at Key West. I had two that were wrecked.

The storm commenced with a downpour of rain which developed into one of the worst hurricanes felt among the keys since 1846. Because of the downpour of rain, the high wind, and the flying coral and shell it was something fearful. We left our house to seek shelter in the postoffice building, which was some 200 ft. further inland. Before we had been there 15 minutes I made up my mind that it would be wrecked, and my wife and self, followed by others, went to the railroad grade, the highest point that we could then reach, and there held onto the rails.

An hour later the postoffice left its foundation, and came crashing towards the railroad not more than 100 ft. from where we were holding on. I am certain that at that time the wind was blowing at a rate of 110 miles an hour. The water began to come up around us, and we crawled on our hands and knees, never letting go of the rails, to the wrecked postoffice building, which was on the tracks. By using an old ladder we climbed into the attic and remained there until the first blow was over. The wind, during the first blow, came from the southeast, then for 15 minutes it was a dead calm, and then it came suddenly out of the northwest and raged for another hour. This second blow we spent in a small bungalow.

IMPROVEMENTS DESIRED FOR VENEER MACHINERY—Users of veneer-cutting machinery report a need of a practical variable feed for rotary machines and pressurebars. They insist that an easily operated mechanism by which the thickness of the cut can be changed instantly would be an improvement much needed and sure of instant adoption.